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////////////////////////////////////
tcl_power2_2ary_i0 R=2 i=0
////////////////////////////////////
binary angle tree search (N=12)
theta= atan(pow(2,0) = 0.785398

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.....
* A: the leaf optimal path R=2 i=0
.....
* leaf min node : depth= 11 theta= +3.201648e-04 id=2543

```

```

path type : leafmin
dp= 0 th=+0.785398 +7.8539816340e-01 br= 0 : -0.785398 0.785398
dp= 1 th=+0 +0.0000000000e+00 br= 0 : -0.463648 0.463648
dp= 2 th=-0.463648 -4.6364760900e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.218669 -2.1866894587e-01 br= 1 : -0.124355 0.124355
dp= 4 th=-0.094314 -9.4313951327e-02 br= 1 : -0.062419 0.062419
dp= 5 th=-0.0318951 -3.1895141331e-02 br= 1 : -0.031240 0.031240
dp= 6 th=-0.000655308 -6.5530790095e-04 br= 1 : -0.015624 0.015624
dp= 7 th=+0.0149684 +1.4968420720e-02 br= 0 : -0.007812 0.007812
dp= 8 th=+0.00715608 +7.1560796594e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00324985 +3.2498495275e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.00129673 +1.2967270110e-03 br= 0 : -0.000977 0.000977
dp=11 th=+0.000320165 +3.2016482142e-04

```

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.....
* B: the global optimal path R=2 i=0
.....
level min node : depth= 0 theta= +7.853982e-01 id=0
level min node : depth= 1 theta= +0.000000e+00 id=1
level min node : depth= 2 theta= -4.636476e-01 id=3
level min node : depth= 3 theta= -2.186689e-01 id=8
level min node : depth= 4 theta= -9.431395e-02 id=18
level min node : depth= 5 theta= -3.189514e-02 id=38
level min node : depth= 6 theta= -6.553079e-04 id=78
level min node : depth= 7 theta= +1.496842e-02 id=158
level min node : depth= 8 theta= +7.156080e-03 id=317
level min node : depth= 9 theta= +3.249850e-03 id=635
level min node : depth= 10 theta= +1.296727e-03 id=1271
level min node : depth= 11 theta= +3.201648e-04 id=2543

* global min node : depth= 1 theta= +0.000000e+00 id=1

```

```

path type : globalmin
dp= 0 th=+0.785398 +7.8539816340e-01 br= 0 : -0.785398 0.785398
dp= 1 th=+0 +0.0000000000e+00

```

```

.....
* C: the cordic path R=2 i=0
.....
* cordic min node : depth= 11 theta= +3.201648e-04 id=2543

```

```

path type : cordic
dp= 0 th=+0.785398 +7.8539816340e-01 br= 0 : -0.785398 0.785398
dp= 1 th=+0 +0.0000000000e+00 br= 0 : -0.463648 0.463648
dp= 2 th=-0.463648 -4.6364760900e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.218669 -2.1866894587e-01 br= 1 : -0.124355 0.124355
dp= 4 th=-0.094314 -9.4313951327e-02 br= 1 : -0.062419 0.062419
dp= 5 th=-0.0318951 -3.1895141331e-02 br= 1 : -0.031240 0.031240
dp= 6 th=-0.000655308 -6.5530790095e-04 br= 1 : -0.015624 0.015624
dp= 7 th=+0.0149684 +1.4968420720e-02 br= 0 : -0.007812 0.007812
dp= 8 th=+0.00715608 +7.1560796594e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00324985 +3.2498495275e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.00129673 +1.2967270110e-03 br= 0 : -0.000977 0.000977
dp=11 th=+0.000320165 +3.2016482142e-04

```

```

////////////////////////////////////
tcl_power2_2ary_i1 R=2 i=1
////////////////////////////////////

```

binary angle tree search (N=12)
theta= atan(pow(2,-1)) = 0.463648

.....
* A: the leaf optimal path R=2 i=1

.....
* leaf min node : depth= 11 theta= +8.354668e-04 id=2740

path type : leafmin

dp= 0	th=+0.463648	+4.6364760900e-01	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.321751	-3.2175055440e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=+0.141897	+1.4189705460e-01	br= 0	:	-0.244979	0.244979
dp= 3	th=-0.103082	-1.0308160852e-01	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.0212734	+2.1273386024e-02	br= 0	:	-0.062419	0.062419
dp= 5	th=-0.0411454	-4.1145423972e-02	br= 1	:	-0.031240	0.031240
dp= 6	th=-0.00990559	-9.9055905416e-03	br= 1	:	-0.015624	0.015624
dp= 7	th=+0.00571814	+5.7181380788e-03	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.0020942	-2.0942029813e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=+0.00181203	+1.8120271507e-03	br= 0	:	-0.001953	0.001953
dp=10	th=-0.000141095	-1.4109536576e-04	br= 1	:	-0.000977	0.000977
dp=11	th=+0.000835467	+8.3546682380e-04				

.....
* B: the global optimal path R=2 i=1

.....
level min node : depth= 0 theta= +4.636476e-01 id=0
level min node : depth= 1 theta= -3.217506e-01 id=1
level min node : depth= 2 theta= +1.418971e-01 id=4
level min node : depth= 3 theta= -1.030816e-01 id=9
level min node : depth= 4 theta= +2.127339e-02 id=20
level min node : depth= 5 theta= -4.114542e-02 id=41
level min node : depth= 6 theta= -9.905591e-03 id=84
level min node : depth= 7 theta= +5.718138e-03 id=170
level min node : depth= 8 theta= -2.094203e-03 id=341
level min node : depth= 9 theta= +1.812027e-03 id=684
level min node : depth= 10 theta= -1.410954e-04 id=1369
level min node : depth= 11 theta= +8.354668e-04 id=2740

* global min node : depth= 10 theta= -1.410954e-04 id=1369

path type : globalmin

dp= 0	th=+0.463648	+4.6364760900e-01	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.321751	-3.2175055440e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=+0.141897	+1.4189705460e-01	br= 0	:	-0.244979	0.244979
dp= 3	th=-0.103082	-1.0308160852e-01	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.0212734	+2.1273386024e-02	br= 0	:	-0.062419	0.062419
dp= 5	th=-0.0411454	-4.1145423972e-02	br= 1	:	-0.031240	0.031240
dp= 6	th=-0.00990559	-9.9055905416e-03	br= 1	:	-0.015624	0.015624
dp= 7	th=+0.00571814	+5.7181380788e-03	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.0020942	-2.0942029813e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=+0.00181203	+1.8120271507e-03	br= 0	:	-0.001953	0.001953
dp=10	th=-0.000141095	-1.4109536576e-04				

.....
* C: the cordic path R=2 i=1

.....
* cordic min node : depth= 11 theta= +8.354668e-04 id=2739

path type : cordic

dp= 0	th=+0.463648	+4.6364760900e-01	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.321751	-3.2175055440e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=+0.141897	+1.4189705460e-01	br= 0	:	-0.244979	0.244979
dp= 3	th=-0.103082	-1.0308160852e-01	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.0212734	+2.1273386024e-02	br= 0	:	-0.062419	0.062419
dp= 5	th=-0.0411454	-4.1145423972e-02	br= 1	:	-0.031240	0.031240
dp= 6	th=-0.00990559	-9.9055905416e-03	br= 1	:	-0.015624	0.015624
dp= 7	th=+0.00571814	+5.7181380788e-03	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.0020942	-2.0942029813e-03	br= 1	:	-0.003906	0.003906

```
dp= 9 th=+0.00181203 +1.8120271507e-03 br= 0 : -0.001953 0.001953
dp=10 th=-0.000141095 -1.4109536576e-04 br= 1 : -0.000977 0.000977
dp=11 th=+0.000835467 +8.3546682380e-04
```

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;;;;;;;;;;;;;
tcl_power2_2ary_i2 R=2 i=2
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```
;;;;;;;;;;;;;
binary angle tree search (N=12)
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```
theta= atan(pow(2,-2) = 0.244979
```

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.....
* A: the leaf optimal path R=2 i=2
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.....
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```
* leaf min node : depth= 11 theta= -2.137727e-05 id=2856
```

```
path type : leafmin
```

```
dp= 0 th=+0.244979 +2.4497866313e-01 br= 0 : -0.785398 0.785398
dp= 1 th=-0.54042 -5.4041950027e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.0767719 -7.6771891270e-02 br= 1 : -0.244979 0.244979
dp= 3 th=+0.168207 +1.6820677186e-01 br= 0 : -0.124355 0.124355
dp= 4 th=+0.0438518 +4.3851777310e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.018567 -1.8567032686e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0126728 +1.2672800745e-02 br= 0 : -0.015624 0.015624
dp= 7 th=-0.00295093 -2.9509278758e-03 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00486141 +4.8614131843e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.000955183 +9.5518305229e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.000997939 -9.9793946419e-04 br= 1 : -0.000977 0.000977
dp=11 th=-2.13773e-05 -2.1377274627e-05
```

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.....
* B: the global optimal path R=2 i=2
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.....
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```
level min node : depth= 0 theta= +2.449787e-01 id=0
level min node : depth= 1 theta= -5.404195e-01 id=1
level min node : depth= 2 theta= -7.677189e-02 id=4
level min node : depth= 3 theta= +1.682068e-01 id=10
level min node : depth= 4 theta= +4.385178e-02 id=21
level min node : depth= 5 theta= -1.856703e-02 id=43
level min node : depth= 6 theta= +1.267280e-02 id=88
level min node : depth= 7 theta= -2.950928e-03 id=177
level min node : depth= 8 theta= +4.861413e-03 id=356
level min node : depth= 9 theta= +9.551831e-04 id=713
level min node : depth= 10 theta= -9.979395e-04 id=1427
level min node : depth= 11 theta= -2.137727e-05 id=2856
```

```
* global min node : depth= 11 theta= -2.137727e-05 id=2856
```

```
path type : globalmin
```

```
dp= 0 th=+0.244979 +2.4497866313e-01 br= 0 : -0.785398 0.785398
dp= 1 th=-0.54042 -5.4041950027e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.0767719 -7.6771891270e-02 br= 1 : -0.244979 0.244979
dp= 3 th=+0.168207 +1.6820677186e-01 br= 0 : -0.124355 0.124355
dp= 4 th=+0.0438518 +4.3851777310e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.018567 -1.8567032686e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0126728 +1.2672800745e-02 br= 0 : -0.015624 0.015624
dp= 7 th=-0.00295093 -2.9509278758e-03 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00486141 +4.8614131843e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.000955183 +9.5518305229e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.000997939 -9.9793946419e-04 br= 1 : -0.000977 0.000977
dp=11 th=-2.13773e-05 -2.1377274627e-05
```

```
.....
* C: the cordic path R=2 i=2
```

```
.....
```

```
* cordic min node : depth= 11 theta= -2.137727e-05 id=2855
```

```
path type : cordic
```

```
dp= 0 th=+0.244979 +2.4497866313e-01 br= 0 : -0.785398 0.785398
dp= 1 th=-0.54042 -5.4041950027e-01 br= 1 : -0.463648 0.463648
```

```

dp= 2 th=-0.0767719 -7.6771891270e-02 br= 1 : -0.244979 0.244979
dp= 3 th=+0.168207 +1.6820677186e-01 br= 0 : -0.124355 0.124355
dp= 4 th=+0.0438518 +4.3851777310e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.018567 -1.8567032686e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0126728 +1.2672800745e-02 br= 0 : -0.015624 0.015624
dp= 7 th=-0.00295093 -2.9509278758e-03 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00486141 +4.8614131843e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.000955183 +9.5518305229e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.000997939 -9.9793946419e-04 br= 1 : -0.000977 0.000977
dp=11 th=-2.13773e-05 -2.1377274627e-05

```

```

////////////////////////////////////
tcl_power2_2ary_i3 R=2 i=3
////////////////////////////////////
binary angle tree search (N=12)
theta= atan(pow(2,-3)) = 0.124355

```

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.....
* A: the leaf optimal path R=2 i=3
.....
* leaf min node : depth= 11 theta= -2.865973e-04 id=3095

```

```

path type : leafmin
dp= 0 th=+0.124355 +1.2435499455e-01 br= 1 : -0.785398 0.785398
dp= 1 th=+0.909753 +9.0975315794e-01 br= 0 : -0.463648 0.463648
dp= 2 th=+0.446106 +4.4610554894e-01 br= 0 : -0.244979 0.244979
dp= 3 th=+0.201127 +2.0112688582e-01 br= 0 : -0.124355 0.124355
dp= 4 th=+0.0767719 +7.6771891270e-02 br= 0 : -0.062419 0.062419
dp= 5 th=+0.0143531 +1.4353081274e-02 br= 0 : -0.031240 0.031240
dp= 6 th=-0.0168868 -1.6886752156e-02 br= 1 : -0.015624 0.015624
dp= 7 th=-0.00126302 -1.2630235360e-03 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00654932 +6.5493175241e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00264309 +2.6430873922e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.000689965 +6.8996487568e-04 br= 0 : -0.000977 0.000977
dp=11 th=-0.000286597 -2.8659731387e-04

```

```

.....
* B: the global optimal path R=2 i=3
.....
level min node : depth= 0 theta= +1.243550e-01 id=0
level min node : depth= 1 theta= -6.610432e-01 id=1
level min node : depth= 2 theta= -1.973956e-01 id=4
level min node : depth= 3 theta= +4.758310e-02 id=10
level min node : depth= 4 theta= -7.677189e-02 id=21
level min node : depth= 5 theta= -1.435308e-02 id=44
level min node : depth= 6 theta= -1.688675e-02 id=95
level min node : depth= 7 theta= -1.263024e-03 id=192
level min node : depth= 8 theta= -6.549318e-03 id=363
level min node : depth= 9 theta= -2.643087e-03 id=728
level min node : depth= 10 theta= -6.899649e-04 id=1458
level min node : depth= 11 theta= -2.865973e-04 id=3095

```

```

* global min node : depth= 11 theta= -2.865973e-04 id=3095

```

```

path type : globalmin
dp= 0 th=+0.124355 +1.2435499455e-01 br= 1 : -0.785398 0.785398
dp= 1 th=+0.909753 +9.0975315794e-01 br= 0 : -0.463648 0.463648
dp= 2 th=+0.446106 +4.4610554894e-01 br= 0 : -0.244979 0.244979
dp= 3 th=+0.201127 +2.0112688582e-01 br= 0 : -0.124355 0.124355
dp= 4 th=+0.0767719 +7.6771891270e-02 br= 0 : -0.062419 0.062419
dp= 5 th=+0.0143531 +1.4353081274e-02 br= 0 : -0.031240 0.031240
dp= 6 th=-0.0168868 -1.6886752156e-02 br= 1 : -0.015624 0.015624
dp= 7 th=-0.00126302 -1.2630235360e-03 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00654932 +6.5493175241e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00264309 +2.6430873922e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.000689965 +6.8996487568e-04 br= 0 : -0.000977 0.000977
dp=11 th=-0.000286597 -2.8659731387e-04

```

```

.....

```

* C: the cordic path R=2 i=3

* cordic min node : depth= 11 theta= +2.865973e-04 id=2917

path type : cordic

dp= 0	th=+0.124355	+1.2435499455e-01	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.661043	-6.6104316885e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=-0.197396	-1.9739555985e-01	br= 1	:	-0.244979	0.244979
dp= 3	th=+0.0475831	+4.7583103277e-02	br= 0	:	-0.124355	0.124355
dp= 4	th=-0.0767719	-7.6771891270e-02	br= 1	:	-0.062419	0.062419
dp= 5	th=-0.0143531	-1.4353081274e-02	br= 1	:	-0.031240	0.031240
dp= 6	th=+0.0168868	+1.6886752156e-02	br= 0	:	-0.015624	0.015624
dp= 7	th=+0.00126302	+1.2630235360e-03	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.00654932	-6.5493175241e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=-0.00264309	-2.6430873922e-03	br= 1	:	-0.001953	0.001953
dp=10	th=-0.000689965	-6.8996487568e-04	br= 1	:	-0.000977	0.000977
dp=11	th=+0.000286597	+2.8659731387e-04				

////////////////////////////////////
tcl_power2_2ary_i4 R=2 i=4

////////////////////////////////////
binary angle tree search (N=12)
theta= atan(pow(2,-4) = 0.0624188

.....
* A: the leaf optimal path R=2 i=4

* leaf min node : depth= 11 theta= -2.568850e-04 id=2950

path type : leafmin

dp= 0	th=+0.0624188	+6.2418809996e-02	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.722979	-7.2297935340e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=-0.259332	-2.5933174440e-01	br= 1	:	-0.244979	0.244979
dp= 3	th=-0.0143531	-1.4353081274e-02	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.110002	+1.1000191327e-01	br= 0	:	-0.062419	0.062419
dp= 5	th=+0.0475831	+4.7583103277e-02	br= 0	:	-0.031240	0.031240
dp= 6	th=+0.0163433	+1.6343269847e-02	br= 0	:	-0.015624	0.015624
dp= 7	th=+0.000719541	+7.1954122624e-04	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.0070928	-7.0927998339e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=-0.00318657	-3.1865697019e-03	br= 1	:	-0.001953	0.001953
dp=10	th=-0.00123345	-1.2334471854e-03	br= 1	:	-0.000977	0.000977
dp=11	th=-0.000256885	-2.5688499586e-04				

.....
* B: the global optimal path R=2 i=4

- level min node : depth= 0 theta= +6.241881e-02 id=0
- level min node : depth= 1 theta= -7.229794e-01 id=1
- level min node : depth= 2 theta= -2.593317e-01 id=4
- level min node : depth= 3 theta= -1.435308e-02 id=10
- level min node : depth= 4 theta= +1.483571e-02 id=23
- level min node : depth= 5 theta= -4.758310e-02 id=47
- level min node : depth= 6 theta= -1.634327e-02 id=96
- level min node : depth= 7 theta= -7.195412e-04 id=194
- level min node : depth= 8 theta= -7.092800e-03 id=367
- level min node : depth= 9 theta= -3.186570e-03 id=736
- level min node : depth= 10 theta= -1.233447e-03 id=1474
- level min node : depth= 11 theta= -2.568850e-04 id=2950

* global min node : depth= 11 theta= -2.568850e-04 id=2950

path type : globalmin

dp= 0	th=+0.0624188	+6.2418809996e-02	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.722979	-7.2297935340e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=-0.259332	-2.5933174440e-01	br= 1	:	-0.244979	0.244979
dp= 3	th=-0.0143531	-1.4353081274e-02	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.110002	+1.1000191327e-01	br= 0	:	-0.062419	0.062419
dp= 5	th=+0.0475831	+4.7583103277e-02	br= 0	:	-0.031240	0.031240
dp= 6	th=+0.0163433	+1.6343269847e-02	br= 0	:	-0.015624	0.015624

```
dp= 7 th=+0.000719541 +7.1954122624e-04 br= 0 : -0.007812 0.007812
dp= 8 th=-0.0070928 -7.0927998339e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00318657 -3.1865697019e-03 br= 1 : -0.001953 0.001953
dp=10 th=-0.00123345 -1.2334471854e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000256885 -2.5688499586e-04
```

```
.....
* C: the cordic path R=2 i=4
```

```
.....
* cordic min node : depth= 11 theta= -2.568850e-04 id=2949
```

```
path type : cordic
```

```
dp= 0 th=+0.0624188 +6.2418809996e-02 br= 0 : -0.785398 0.785398
dp= 1 th=-0.722979 -7.2297935340e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.259332 -2.5933174440e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0143531 -1.4353081274e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.110002 +1.1000191327e-01 br= 0 : -0.062419 0.062419
dp= 5 th=+0.0475831 +4.7583103277e-02 br= 0 : -0.031240 0.031240
dp= 6 th=+0.0163433 +1.6343269847e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.000719541 +7.1954122624e-04 br= 0 : -0.007812 0.007812
dp= 8 th=-0.0070928 -7.0927998339e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00318657 -3.1865697019e-03 br= 1 : -0.001953 0.001953
dp=10 th=-0.00123345 -1.2334471854e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000256885 -2.5688499586e-04
```

```
;;;;;;;;;;;;;
tcl_power2_2ary_i5 R=2 i=5
```

```
;;;;;;;;;;;;;
binary angle tree search (N=12)
theta= atan(pow(2,-5) = 0.0312398
```

```
.....
* A: the leaf optimal path R=2 i=5
```

```
.....
* leaf min node : depth= 11 theta= +1.884043e-04 id=3143
```

```
path type : leafmin
```

```
dp= 0 th=+0.0312398 +3.1239833430e-02 br= 1 : -0.785398 0.785398
dp= 1 th=+0.816638 +8.1663799683e-01 br= 0 : -0.463648 0.463648
dp= 2 th=+0.35299 +3.5299038783e-01 br= 0 : -0.244979 0.244979
dp= 3 th=+0.108012 +1.0801172470e-01 br= 0 : -0.124355 0.124355
dp= 4 th=-0.0163433 -1.6343269847e-02 br= 1 : -0.062419 0.062419
dp= 5 th=+0.0460755 +4.6075540149e-02 br= 0 : -0.031240 0.031240
dp= 6 th=+0.0148357 +1.4835706719e-02 br= 0 : -0.015624 0.015624
dp= 7 th=-0.000788022 -7.8802190150e-04 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00702432 +7.0243191586e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00311809 +3.1180890266e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.00116497 +1.1649665102e-03 br= 0 : -0.000977 0.000977
dp=11 th=+0.000188404 +1.8840432059e-04
```

```
.....
* B: the global optimal path R=2 i=5
```

```
.....
level min node : depth= 0 theta= +3.123983e-02 id=0
level min node : depth= 1 theta= -7.541583e-01 id=1
level min node : depth= 2 theta= -2.905107e-01 id=4
level min node : depth= 3 theta= -4.553206e-02 id=10
level min node : depth= 4 theta= -1.634327e-02 id=23
level min node : depth= 5 theta= +1.640413e-02 id=45
level min node : depth= 6 theta= +1.483571e-02 id=97
level min node : depth= 7 theta= +7.880219e-04 id=184
level min node : depth= 8 theta= +7.024319e-03 id=392
level min node : depth= 9 theta= +3.118089e-03 id=785
level min node : depth= 10 theta= +1.164967e-03 id=1571
level min node : depth= 11 theta= +1.884043e-04 id=3143
```

```
* global min node : depth= 11 theta= +1.884043e-04 id=3143
```

```
path type : globalmin
```

```

dp= 0 th=+0.0312398 +3.1239833430e-02 br= 1 : -0.785398 0.785398
dp= 1 th=+0.816638 +8.1663799683e-01 br= 0 : -0.463648 0.463648
dp= 2 th=+0.35299 +3.5299038783e-01 br= 0 : -0.244979 0.244979
dp= 3 th=+0.108012 +1.0801172470e-01 br= 0 : -0.124355 0.124355
dp= 4 th=-0.0163433 -1.6343269847e-02 br= 1 : -0.062419 0.062419
dp= 5 th=+0.0460755 +4.6075540149e-02 br= 0 : -0.031240 0.031240
dp= 6 th=+0.0148357 +1.4835706719e-02 br= 0 : -0.015624 0.015624
dp= 7 th=-0.000788022 -7.8802190150e-04 br= 1 : -0.007812 0.007812
dp= 8 th=+0.00702432 +7.0243191586e-03 br= 0 : -0.003906 0.003906
dp= 9 th=+0.00311809 +3.1180890266e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.00116497 +1.1649665102e-03 br= 0 : -0.000977 0.000977
dp=11 th=+0.000188404 +1.8840432059e-04

```

```

.....
* C: the cordic path R=2 i=5
.....
* cordic min node : depth= 11 theta= -1.884043e-04 id=2965

```

```

path type : cordic
dp= 0 th=+0.0312398 +3.1239833430e-02 br= 0 : -0.785398 0.785398
dp= 1 th=-0.754158 -7.5415832997e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.290511 -2.9051072097e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0455321 -4.5532057840e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0788229 +7.8822936707e-02 br= 0 : -0.062419 0.062419
dp= 5 th=+0.0164041 +1.6404126711e-02 br= 0 : -0.031240 0.031240
dp= 6 th=-0.0148357 -1.4835706719e-02 br= 1 : -0.015624 0.015624
dp= 7 th=+0.000788022 +7.8802190150e-04 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00702432 -7.0243191586e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00311809 -3.1180890266e-03 br= 1 : -0.001953 0.001953
dp=10 th=-0.00116497 -1.1649665102e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000188404 -1.8840432059e-04

```

```

;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tcl_power2_2ary_i6 R=2 i=6
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
binary angle tree search (N=12)
theta= atan(pow(2,-6) = 0.0156237

```

```

.....
* A: the leaf optimal path R=2 i=6
.....
* leaf min node : depth= 11 theta= -1.798270e-04 id=2974

```

```

path type : leafmin
dp= 0 th=+0.0156237 +1.5623728620e-02 br= 0 : -0.785398 0.785398
dp= 1 th=-0.769774 -7.6977443478e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.306127 -3.0612682578e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0611482 -6.1148162649e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0632068 +6.3206831897e-02 br= 0 : -0.062419 0.062419
dp= 5 th=+0.000788022 +7.8802190150e-04 br= 0 : -0.031240 0.031240
dp= 6 th=-0.0304518 -3.0451811529e-02 br= 1 : -0.015624 0.015624
dp= 7 th=-0.0148281 -1.4828082908e-02 br= 1 : -0.007812 0.007812
dp= 8 th=-0.00701574 -7.0157418482e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00310951 -3.1095117162e-03 br= 1 : -0.001953 0.001953
dp=10 th=-0.00115639 -1.1563891997e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000179827 -1.7982701018e-04

```

```

.....
* B: the global optimal path R=2 i=6
.....
level min node : depth= 0 theta= +1.562373e-02 id=0
level min node : depth= 1 theta= -7.697744e-01 id=1
level min node : depth= 2 theta= -3.061268e-01 id=4
level min node : depth= 3 theta= -6.114816e-02 id=10
level min node : depth= 4 theta= -3.195937e-02 id=23
level min node : depth= 5 theta= +7.880219e-04 id=45
level min node : depth= 6 theta= -7.803981e-04 id=97
level min node : depth= 7 theta= -1.482808e-02 id=184
level min node : depth= 8 theta= -7.015742e-03 id=370

```

level min node : depth= 9 theta= -3.109512e-03 id=742
level min node : depth= 10 theta= -1.156389e-03 id=1486
level min node : depth= 11 theta= -1.798270e-04 id=2974

* global min node : depth= 11 theta= -1.798270e-04 id=2974

path type : globalmin

dp= 0	th=+0.0156237	+1.5623728620e-02	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.769774	-7.6977443478e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=-0.306127	-3.0612682578e-01	br= 1	:	-0.244979	0.244979
dp= 3	th=-0.0611482	-6.1148162649e-02	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.0632068	+6.3206831897e-02	br= 0	:	-0.062419	0.062419
dp= 5	th=+0.000788022	+7.8802190150e-04	br= 0	:	-0.031240	0.031240
dp= 6	th=-0.0304518	-3.0451811529e-02	br= 1	:	-0.015624	0.015624
dp= 7	th=-0.0148281	-1.4828082908e-02	br= 1	:	-0.007812	0.007812
dp= 8	th=-0.00701574	-7.0157418482e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=-0.00310951	-3.1095117162e-03	br= 1	:	-0.001953	0.001953
dp=10	th=-0.00115639	-1.1563891997e-03	br= 1	:	-0.000977	0.000977
dp=11	th=-0.000179827	-1.7982701018e-04				

.....

* C: the cordic path R=2 i=6

.....

* cordic min node : depth= 11 theta= -1.798270e-04 id=2973

path type : cordic

dp= 0	th=+0.0156237	+1.5623728620e-02	br= 0	:	-0.785398	0.785398
dp= 1	th=-0.769774	-7.6977443478e-01	br= 1	:	-0.463648	0.463648
dp= 2	th=-0.306127	-3.0612682578e-01	br= 1	:	-0.244979	0.244979
dp= 3	th=-0.0611482	-6.1148162649e-02	br= 1	:	-0.124355	0.124355
dp= 4	th=+0.0632068	+6.3206831897e-02	br= 0	:	-0.062419	0.062419
dp= 5	th=+0.000788022	+7.8802190150e-04	br= 0	:	-0.031240	0.031240
dp= 6	th=-0.0304518	-3.0451811529e-02	br= 1	:	-0.015624	0.015624
dp= 7	th=-0.0148281	-1.4828082908e-02	br= 1	:	-0.007812	0.007812
dp= 8	th=-0.00701574	-7.0157418482e-03	br= 1	:	-0.003906	0.003906
dp= 9	th=-0.00310951	-3.1095117162e-03	br= 1	:	-0.001953	0.001953
dp=10	th=-0.00115639	-1.1563891997e-03	br= 1	:	-0.000977	0.000977
dp=11	th=-0.000179827	-1.7982701018e-04				

;;;

tcl_power2_2ary_i7 R=2 i=7

;;;

binary angle tree search (N=12)

theta= atan(pow(2,-7) = 0.00781234

.....

* A: the leaf optimal path R=2 i=7

.....

* leaf min node : depth= 11 theta= +1.961473e-04 id=3155

path type : leafmin

dp= 0	th=+0.00781234	+7.8123410601e-03	br= 1	:	-0.785398	0.785398
dp= 1	th=+0.793211	+7.9321050446e-01	br= 0	:	-0.463648	0.463648
dp= 2	th=+0.329563	+3.2956289546e-01	br= 0	:	-0.244979	0.244979
dp= 3	th=+0.0845842	+8.4584232330e-02	br= 0	:	-0.124355	0.124355
dp= 4	th=-0.0397708	-3.9770762217e-02	br= 1	:	-0.062419	0.062419
dp= 5	th=+0.022648	+2.2648047779e-02	br= 0	:	-0.031240	0.031240
dp= 6	th=-0.00859179	-8.5917856512e-03	br= 1	:	-0.015624	0.015624
dp= 7	th=+0.00703194	+7.0319429693e-03	br= 0	:	-0.007812	0.007812
dp= 8	th=-0.000780398	-7.8039809082e-04	br= 1	:	-0.003906	0.003906
dp= 9	th=+0.00312583	+3.1258320411e-03	br= 0	:	-0.001953	0.001953
dp=10	th=+0.00117271	+1.1727095247e-03	br= 0	:	-0.000977	0.000977
dp=11	th=+0.000196147	+1.9614733511e-04				

.....

* B: the global optimal path R=2 i=7

.....

level min node : depth= 0 theta= +7.812341e-03 id=0

level min node : depth= 1 theta= -7.775858e-01 id=1


```
level min node : depth= 2 theta= -3.139382e-01 id=4
level min node : depth= 3 theta= -6.895955e-02 id=10
level min node : depth= 4 theta= -3.977076e-02 id=23
level min node : depth= 5 theta= -7.023366e-03 id=45
level min node : depth= 6 theta= -8.591786e-03 id=97
level min node : depth= 7 theta= +7.031943e-03 id=196
level min node : depth= 8 theta= +7.803981e-04 id=371
level min node : depth= 9 theta= +3.125832e-03 id=788
level min node : depth= 10 theta= +1.172710e-03 id=1577
level min node : depth= 11 theta= +1.961473e-04 id=3155
```

```
* global min node : depth= 11 theta= +1.961473e-04 id=3155
```

```
path type : globalmin
```

```
dp= 0 th=+0.00781234 +7.8123410601e-03 br= 1 : -0.785398 0.785398
dp= 1 th=+0.793211 +7.9321050446e-01 br= 0 : -0.463648 0.463648
dp= 2 th=+0.329563 +3.2956289546e-01 br= 0 : -0.244979 0.244979
dp= 3 th=+0.0845842 +8.4584232330e-02 br= 0 : -0.124355 0.124355
dp= 4 th=-0.0397708 -3.9770762217e-02 br= 1 : -0.062419 0.062419
dp= 5 th=+0.022648 +2.2648047779e-02 br= 0 : -0.031240 0.031240
dp= 6 th=-0.00859179 -8.5917856512e-03 br= 1 : -0.015624 0.015624
dp= 7 th=+0.00703194 +7.0319429693e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.000780398 -7.8039809082e-04 br= 1 : -0.003906 0.003906
dp= 9 th=+0.00312583 +3.1258320411e-03 br= 0 : -0.001953 0.001953
dp=10 th=+0.00117271 +1.1727095247e-03 br= 0 : -0.000977 0.000977
dp=11 th=+0.000196147 +1.9614733511e-04
```

```
.....
```

```
* C: the cordic path R=2 i=7
```

```
.....
```

```
* cordic min node : depth= 11 theta= -1.961473e-04 id=2977
```

```
path type : cordic
```

```
dp= 0 th=+0.00781234 +7.8123410601e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.777586 -7.7758582234e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.313938 -3.1393821334e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0689596 -6.8959550210e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0553954 +5.5395444337e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.00702337 -7.0233656589e-03 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0242165 +2.4216467771e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00859274 +8.5927391509e-03 br= 0 : -0.007812 0.007812
dp= 8 th=+0.000780398 +7.8039809082e-04 br= 0 : -0.003906 0.003906
dp= 9 th=-0.00312583 -3.1258320411e-03 br= 1 : -0.001953 0.001953
dp=10 th=-0.00117271 -1.1727095247e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000196147 -1.9614733511e-04
```

```
////////////////////////////////////
```

```
tcl_power2_2ary_i8 R=2 i=8
```

```
////////////////////////////////////
```

```
binary angle tree search (N=12)
```

```
theta= atan(pow(2,-8)) = 0.00390623
```

```
.....
```

```
* A: the leaf optimal path R=2 i=8
```

```
.....
```

```
* leaf min node : depth= 11 theta= -1.960430e-04 id=2980
```

```
path type : leafmin
```

```
dp= 0 th=+0.00390623 +3.9062301320e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.781492 -7.8149193327e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.317844 -3.1784432426e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0728657 -7.2865661138e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0514893 +5.1489333409e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0109295 -1.0929476587e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0203104 +2.0310356843e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00468663 +4.6866282228e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00312571 -3.1257128373e-03 br= 1 : -0.003906 0.003906
dp= 9 th=+0.000780517 +7.8051729465e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.00117261 -1.1726052218e-03 br= 1 : -0.000977 0.000977
```

dp=11 th=-0.000196043 -1.9604303227e-04

.....
* B: the global optimal path R=2 i=8

level min node : depth= 0 theta= +3.906230e-03 id=0
level min node : depth= 1 theta= -7.814919e-01 id=1
level min node : depth= 2 theta= -3.178443e-01 id=4
level min node : depth= 3 theta= -7.286566e-02 id=10
level min node : depth= 4 theta= -4.367687e-02 id=23
level min node : depth= 5 theta= -1.092948e-02 id=45
level min node : depth= 6 theta= -1.249790e-02 id=97
level min node : depth= 7 theta= +3.125832e-03 id=196
level min node : depth= 8 theta= -3.125713e-03 id=371
level min node : depth= 9 theta= -7.802789e-04 id=788
level min node : depth= 10 theta= -1.172605e-03 id=1489
level min node : depth= 11 theta= -1.960430e-04 id=2980

* global min node : depth= 11 theta= -1.960430e-04 id=2980

path type : globalmin

dp= 0 th=+0.00390623 +3.9062301320e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.781492 -7.8149193327e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.317844 -3.1784432426e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0728657 -7.2865661138e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0514893 +5.1489333409e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0109295 -1.0929476587e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0203104 +2.0310356843e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00468663 +4.6866282228e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00312571 -3.1257128373e-03 br= 1 : -0.003906 0.003906
dp= 9 th=+0.000780517 +7.8051729465e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.00117261 -1.1726052218e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000196043 -1.9604303227e-04

.....
* C: the cordic path R=2 i=8

* cordic min node : depth= 11 theta= -1.960430e-04 id=2979

path type : cordic

dp= 0 th=+0.00390623 +3.9062301320e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.781492 -7.8149193327e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.317844 -3.1784432426e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0728657 -7.2865661138e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0514893 +5.1489333409e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0109295 -1.0929476587e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0203104 +2.0310356843e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00468663 +4.6866282228e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00312571 -3.1257128373e-03 br= 1 : -0.003906 0.003906
dp= 9 th=+0.000780517 +7.8051729465e-04 br= 0 : -0.001953 0.001953
dp=10 th=-0.00117261 -1.1726052218e-03 br= 1 : -0.000977 0.000977
dp=11 th=-0.000196043 -1.9604303227e-04

////////////////////////////////////
tcl_power2_2ary_i9 R=2 i=9

////////////////////////////////////
binary angle tree search (N=12)
theta= atan(pow(2,-9) = 0.00195312

.....
* A: the leaf optimal path R=2 i=9

* leaf min node : depth= 11 theta= -1.960300e-04 id=2981

path type : leafmin

dp= 0 th=+0.00195312 +1.9531225165e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.783445 -7.8344504088e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.319797 -3.1979743188e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0748188 -7.4818768753e-02 br= 1 : -0.124355 0.124355

```

dp= 4 th=+0.0495362 +4.9536225793e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0128826 -1.2882584202e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0183572 +1.8357249228e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00273352 +2.7335206073e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00507882 -5.0788204528e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00117259 -1.1725903208e-03 br= 1 : -0.001953 0.001953
dp=10 th=+0.000780532 +7.8053219564e-04 br= 0 : -0.000977 0.000977
dp=11 th=-0.00019603 -1.9602999392e-04

```

```

.....
* B: the global optimal path R=2 i=9
.....

```

```

level min node : depth= 0 theta= +1.953123e-03 id=0
level min node : depth= 1 theta= -7.834450e-01 id=1
level min node : depth= 2 theta= -3.197974e-01 id=4
level min node : depth= 3 theta= -7.481877e-02 id=10
level min node : depth= 4 theta= -4.562998e-02 id=23
level min node : depth= 5 theta= -1.288258e-02 id=45
level min node : depth= 6 theta= -1.445100e-02 id=97
level min node : depth= 7 theta= +1.172724e-03 id=196
level min node : depth= 8 theta= -5.078820e-03 id=371
level min node : depth= 9 theta= -1.172590e-03 id=744
level min node : depth= 10 theta= -7.802640e-04 id=1578
level min node : depth= 11 theta= -1.960300e-04 id=2981

```

```

* global min node : depth= 11 theta= -1.960300e-04 id=2981

```

```

path type : globalmin

```

```

dp= 0 th=+0.00195312 +1.9531225165e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.783445 -7.8344504088e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.319797 -3.1979743188e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0748188 -7.4818768753e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0495362 +4.9536225793e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0128826 -1.2882584202e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0183572 +1.8357249228e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00273352 +2.7335206073e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00507882 -5.0788204528e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00117259 -1.1725903208e-03 br= 1 : -0.001953 0.001953
dp=10 th=+0.000780532 +7.8053219564e-04 br= 0 : -0.000977 0.000977
dp=11 th=-0.00019603 -1.9602999392e-04

```

```

.....
* C: the cordic path R=2 i=9
.....

```

```

* cordic min node : depth= 11 theta= -1.960300e-04 id=2981

```

```

path type : cordic

```

```

dp= 0 th=+0.00195312 +1.9531225165e-03 br= 0 : -0.785398 0.785398
dp= 1 th=-0.783445 -7.8344504088e-01 br= 1 : -0.463648 0.463648
dp= 2 th=-0.319797 -3.1979743188e-01 br= 1 : -0.244979 0.244979
dp= 3 th=-0.0748188 -7.4818768753e-02 br= 1 : -0.124355 0.124355
dp= 4 th=+0.0495362 +4.9536225793e-02 br= 0 : -0.062419 0.062419
dp= 5 th=-0.0128826 -1.2882584202e-02 br= 1 : -0.031240 0.031240
dp= 6 th=+0.0183572 +1.8357249228e-02 br= 0 : -0.015624 0.015624
dp= 7 th=+0.00273352 +2.7335206073e-03 br= 0 : -0.007812 0.007812
dp= 8 th=-0.00507882 -5.0788204528e-03 br= 1 : -0.003906 0.003906
dp= 9 th=-0.00117259 -1.1725903208e-03 br= 1 : -0.001953 0.001953
dp=10 th=+0.000780532 +7.8053219564e-04 br= 0 : -0.000977 0.000977
dp=11 th=-0.00019603 -1.9602999392e-04

```