```
C:\Users\Denise_Vella\Desktop\ronnie-andrews-2-ccm-reproduction-and-convergence-main>cargo run --release
    --features hp -p ccm-reproduction -- run --lambda-sq 250 --n-modes 150 --precision-digits 100 --displ
    ay-digits 100 --top 84
    Finished `release` profile [optimized] target(s) in 0.47s
     Running `target\x86_64-pc-windows-gnu\release\ccm-reproduction.exe run --lambda-sq 250 --n-modes 150
     --precision-digits 100 --display-digits 100 --top 84`
  runtime parallelism: Rayon workers=16, available CPUs=16, RAYON_NUM_THREADS=<unset>
CCM operator: lambda^2=250, N=150, matrix_size=301
  prime powers k <= 250: 68 entries
  precision: 100 decimal digits
  root acquisition: independent CCM discovery (indices 1..=84)
  research capture: claim (requested roots and native artifacts)
  cache artifact: ccm_tau_matrix (reused, source=workstation)
[HP] phase timing: tau construction/reuse=0.563s
  cache artifact: ccm_weil_eigenpair (reused, source=workstation)
[HP] phase timing: Weil eigenstate construction/reuse=0.054s
[HP] eigenstate provenance: unshifted limit reached (2000/2000 steps), shifted refinement=Accepted, final
     relative Tau residual=9.418756423e-121
  cache artifact: ccm_secular_source (computed, source=workstation)
  cache artifact: ccm_root_discovery_window (computed, source=workstation)
[HP] root status summary: 84 total; 78 converged, 6 stagnated, 0 approximate, 0 failed
[HP] stagnated roots retained as computed approximations: indices=79-84; achieved_digits=8.7602115e1..9.7
    103198e1; maximum_iterations=342; full per-root diagnostics are stored in the artifact
[HP] phase timing: root discovery/refinement=3.534s
  cache artifact: ccm_convergence_diagnostics (computed, source=workstation)
  built and solved in 5.780s, smallest Weil eigenvalue epsilon_N = -9.78021e-120

   k     computed eigenvalue        Riemann zero t_k       abs error  matching digits       status
-------------------------------------------------------------------------------------------------
   1  9.65362108180619642819580626669124110857918385140501741747955316783440531524338670869503660096709900
    48  14.13472514173469379045725198356247027078425711569924317568556746014996342980925676494901039317150
    6101        4.4811e0       4.9890e-1    converged
   2  11.13705627899435202484490019994826772570289841143859014918393867037096936963027675024686443314927600
    68  21.02203963877155499262847959389690277733434052490278175462952040358759858606889079971365851418010
    5142        9.8850e0       3.2770e-1    converged
   3  14.13472514173469379045725198356247027078425711569924317568556746014996342980925676494901039317156100
    01  25.01085758014568876321379099256282181865954967255799667249654200674509209844164427784023822455800
    6244        1.0876e1       3.6165e-1    converged
   4  17.22277994763366257987306535648763171842157296594241998919886135622291009572390261296329779328045800
    93  30.42487612585951321031189753058409132018156002371544018096214603699332938933327792029058429390200
    8911        1.3202e1       3.6259e-1    converged
   5  19.44009793199229112783319723200742582669301927007411924384023427484113542916486032648825764654974000
    46  32.93506158773918969066236896407490348881271560351703900928000344078481560863055100593884849613530
    4872        1.3495e1       3.8749e-1    converged
   6  20.95027446727603024162064802873241093128891959920022571863576659859312202975261400772897766891344300
    08  37.58617815882567125721776348070533282140559735083079321833300111362214908961853726473032910494580
    2380        1.6636e1       3.5398e-1    converged
   7  21.02203963877155499262847959389690277733434052490278175462952040358759858606889079971365851418015100
    42  40.91871901214749518739812691463325439572616596277727953616130366725328052872007128299600371988950
    4688        1.9897e1       3.1314e-1    converged
   8  25.01085758014568876321379099256282181865954967255799667249654200674509209844164427784023822455806200
    44  43.32707328091499951949612216540680578264566837183687144687889368552108832230505362645634937106310
    9093        1.8316e1       3.7392e-1    converged
   9  30.42487612585951321031189753058409132018156002371544018096214603699332938933327792029058429390208900
    11  48.00515088116715972794247274942751604168684400114442511777531251981409021641630828133033537230540
    0100        1.7580e1       4.3626e-1    converged
  10  32.36474014996348077374233292111213468199979736747700405155374753284093292739107887981984983819792900
    36  49.77383247767230218191678467856372405772317829967666210078195575043351161151573927873270750740090
    3133        1.7409e1       4.5622e-1    converged
  11  32.93506158773918969066236896407490348881271560351703900928000344078481560863055100593884849613534800
    72  52.97032147771446064414729660888099006382501788882122477990074814031756495030418805413758782709430
    9930        2.0035e1       4.2224e-1    converged
  12  37.58617815882567125721776348070533282140559735083079321833300111362214908961853726473032910494582300
    80  56.44624769706339480436775947670612755278226447171663184545096984395847528027450566690301131427480
    5239        1.8860e1       4.7609e-1    converged
  13  39.63071125318856773208435258488546522387969952789752116276532613616884650628569650574558583939258900
    88  59.34704400260235307965364867499221903109877280646666969812245175474680015269962981183810248707460
```

```
  3355        1.9716e1       4.7857e-1    converged
14  40.918719012147495187398126914633254395726165962777279536161303667253280528720071282996003719889546
  88  60.831778524609809844259901824524003802910090451219178257101348824808493667294920538430841670394 3
  4336        1.9913e1       4.8499e-1    converged
15  43.327073280914999519496122165406805782645668371836871446878893685521088322305053626456349371063190
  93  65.112544048081606660875054253183705029348149295166722405966501086675343232668685384416774784438 6
  5947        2.1785e1       4.7550e-1    converged
16  43.703339681708795182861066048805844889223104526435380101322613519260289485064965888082206034376203
  18  67.079810529494173714478828896522216770107144951745558874196669551694901218956196983530293975085 8
  3303        2.3376e1       4.5781e-1    converged
17  45.545267038557869893589447241872735596085041510247873737880900769018793777927937876992989612232647
  41  69.546401711173979252926857526554738443012474209602510157324539999663387672274910419533344933178 3
  4036        2.4001e1       4.6204e-1    converged
18  47.214262869149015733230085047448905749246263362631733361898080318936563304193992759313972568674062
  15  72.067157674481907582522107969826168390480906621456697086683306151488407372399608348363525330412 1
  7453        2.4853e1       4.6236e-1    converged
19  48.005150881167159727942472749427516041686844001144425117775312519814090216416308281330335372305401
  00  75.704690699083933168326916762030345922811903530697400301647775301574197027706323608384037021834 6
  5280        2.7700e1       4.3665e-1    converged
20  49.773832477672302181916784678563724057723178299676662100781955750433511611515739278732707507400931
  33  77.144840068874805372682664856304637015796032449234461041765231453151139164253715089408288694699 7
  3776        2.7371e1       4.5002e-1    converged
21  51.910848068444374336844127987273342100843976694525806658740394981590746362866287327240319261804583
  73  79.337375020249367922763592877116228190613246743120030878438720497101541932677090974677451994612 1
  2411        2.7427e1       4.6131e-1    converged
22  52.970321477714460644147296608880990063825017888821224779900748140317564950304188054137587827094399
  30  82.910380854086030183164837494770609497508880593782149146571306283235929086356619075512563192334 8
  9682        2.9940e1       4.4236e-1    converged
23  55.137411956832389495569314964425880227055028975848023928750194615928674728798074413602216720016546
  41  84.735492980517050105735311206827741417106627934240818702735529689045271728930280598792282030639 9
  5091        2.9598e1       4.5680e-1    converged
24  56.446247697063394804367759476706127552782264471716631845450969843958475280274505666903011314274852
  39  87.425274613125229406531667850919213252171886401269028186455557938439691049524830750266257480795 4
  3952        3.0979e1       4.5057e-1    converged
25  57.365108969358998063332616182610118841557236627157685544878638453922082845061520626566074243438779
  97  88.809111207634465423682348079509378395444893409818675042199871618814013559182198439520793279503 9
  3306        3.1444e1       4.5092e-1    converged
26  59.347044002602353079653648674992219031098772806466669698122451754746800152699629811838102487074633
  55  92.491899270558484296259725241810684878721794027730646175096750489181028026058770889337863757668 5
  8864        3.3145e1       4.4569e-1    converged
27  60.831778524609809844259901824524003802910090451219178257101348824808493667294920538430841670394343
  36  94.651344040519886966597925815208153937728027015654852019592474274513482105324558440764774015299 6
  0108        3.3820e1       4.4696e-1    converged
28  65.112544048081606660875054253183705029348149295166722405966501086675343232668685384416774784438659
  47  95.870634228245309758741029219246781695256461224987998420529281651651106625360817921895426115572 3
  5640        3.0758e1       4.9373e-1    converged
29  67.079810529494173714478828896522216770107144951745558874196669551694901218956196983530293975085833
  03  98.831194218193692233324420138622327820658039063428196102819321727565547639765553187514528323281 6
  2321        3.1751e1       4.9313e-1    converged
30  67.175210477916914996862010111498286485320405479608099002894366869079115070699030387175550802804912
  24  101.31785100573139122878544794029230896332866384300894799928318715230143082729312355508904945205
  9719        3.4143e1       4.7239e-1    converged
31  69.546401711173979252926857526554738443012474209602510157324539999663387672274910419533344933178340
  36  103.72553804047833941639840810869528083448117306949576451988516579403652210830164880543814549849 2
  0169        3.4179e1       4.8212e-1    converged
32  70.988774864126949194400150834330632955859876586960034755348966875609437405491099805516468548817373
  97  105.44662305232609449367083241411180899728275392853513848056944711418149444757596283977355493196 2
  8145        3.4458e1       4.8574e-1    converged
33  72.067157674481907582522107969826168390480906621456697086683306151488407372399608348363525330412174
  53  107.16861118427640751512335196308619121347670788140476527926471042155240382097809713461077404060 9
  0411        3.5101e1       4.8474e-1    converged
34  73.874515880386642654585013906994086212158249184572375089161878020812236626677314611379205370870669
  65  111.02953554316967452465645030994435041534596839007305684619079476550554454175989221401886129177 1
  8101        3.7155e1       4.7542e-1    converged
35  75.704690699083933168326916762030345922811903530697400301647775301574197027706323608384037021834652
  80  111.87465917699263708561207871677059496031174987338587381661941961969077836440550296762894060634 7
  4483        3.6170e1       4.9038e-1    converged
36  77.144840068874805372682664856304637015796032449234461041765231453151139164253715089408288694699737
  76  114.32022091545271276589093727619107980991765772382989228772843104130628757585284322976204949831 7
```

```
  0899        3.7175e1       4.8787e-1    converged
37  79.337375020249367922763592877116228190613246743120030878438720497101541932677090974677451994612124
  11  116.22668032085755438216080431206475512732985123238322028386264231147470097947562206017603733624 3
  9003        3.6889e1       4.9841e-1    converged
38  81.21827015955295219822166881597898411054385107052822076289576373256887476846016245856100940733446 5
  40  118.79078286597621732297913970269982434730621059280938278419371651419909632211177349955749911593 2
  1518        3.7573e1       4.9991e-1    converged
39  82.91038085408603018316483749477060949750888059378214914657130628323592908635661907551256319233489 6
  82  121.37012500242064591894553297049992272300131063172874230257513263573463204165139220905939384433 0
  1428        3.8460e1       4.9911e-1    converged
40  83.92210712973265958645885579425709495859827674407896378280086893341874080152892354015902119615764 4
  18  122.94682929355258820081746033077001649621438987386351721195003491528850877588261964305531184110 7
  4104        3.9025e1       4.9838e-1    converged
41  84.73549298051705010573531120682774141710662793424081870273552968904527172893028059879228203063995 0
  91  124.25681855434576718473200796612992444157353877469356114035507691395906209728936178009090182253 3
  7391        3.9521e1       4.9749e-1    converged
42  87.42527461312522940653166785091921325217188640126902818645555793843969104952483075026625748079543 9
  52  127.51668387959649512427932376690607626808830988155498248279977930068239612852598832920878360012 4
  6238        4.0091e1       5.0252e-1    converged
43  88.17452389869675343783409250931403450399262283118077428691378328010941422800282245100587737413773 6
  34  129.57870419995605098576803390617997360864095326465943103047083999886089910511656558151491773392 6
  5815        4.1404e1       4.9549e-1    converged
44  88.80911120763446542368234807950937839544489340981867504219987161881401355918219843952079327950393 3
  06  131.08768853093265672356637246150134905920354750297504538313992440777476524562001528156549134141 2
  4702        4.2279e1       4.9144e-1    converged
45  91.32924675622889021468151247212522968621089464458493938889687172647617962559900970217980462283032
  76  133.49773720299758645013049204264060766497417494390467501510225885516301360078474264135928795031 5
  0895        4.2168e1       5.0049e-1    converged
46  92.49189927055848429625972524181068487872179402773064617509675048918102802605877088933786375766858 8
  64  134.75650975337387133132606415716973617839606861364716441697609317354841005683171043236880490592 6
  0328        4.2265e1       5.0357e-1    converged
47  94.65134404051988696659792581520815393772802701565485201959247427451348210532455844076477401529960 1
  08  138.11604205453344320019155519028244785983527462414623568534482856865016723043040891711094527218 7
  7454        4.3465e1       5.0211e-1    converged
48  95.87063422824530975874102921924678169525646122498799842052928165165110662536081792189542611557235 6
  40  139.73620895212138895045004652338246084679005256538260308137013541090386809148527196609290365678 5
  5964        4.3866e1       5.0319e-1    converged
49  98.83119421819369223332442013862232782065803906342819610281932172756554763976555318751452832328162 3
  21  141.12370740402112376194035381847535509030066087974762003210466509596609475871813327814934185093 8
  0468        4.2293e1       5.2334e-1    converged
50  101.31785100573139122878544794029230890633286638430089479992831871523014308272931235550890494520597
  19  143.11184580762063273940512386891392996623310243035463254859522957280693144133349227544427402513
  6984        4.1794e1       5.3456e-1    converged
51  103.72553804047833941639840810869528083448117306949576451988516579403652210830164880543814549849201
  69  146.00098248676551854740250759642682428975741233095803636976884966585760939594767651122740156815
  7793        4.2275e1       5.3827e-1    converged
52  105.44662305232609449367083241411180899728275392853513848056944711418149444757596283977355493196281
  45  147.42276534255960204952118501043150616877277525047683060101046081273818374432638175722054135668 0
  1443        4.1976e1       5.4556e-1    converged
53  107.16861118427640751512335196308619121347670788140476527926471042155240382097809713461077404060904
  11  150.05352042078488035143246723695937062303732155952820044842911127506258214849741871213228260549 6
  1491        4.2885e1       5.4394e-1    converged
54  111.02953554316967452465645030994435041534596839007305684619079476550554454175989221401886129177181
  01  150.92525761224146676185252467830562760242677047299671770031135495336323209786361481438887358731 3
  3914        3.9896e1       5.7784e-1    converged
55  111.87465917699263708561207871677059496031174987338587381661941961969077836440550296762894060634744
  83  153.02469381119889619825654425518544650859043490414550667519976756379462099378149040195474913153 6
  9249        4.1150e1       5.7039e-1    converged
56  114.32022091545271276589093727619107980991765772382989228772843104130628757585284322976204949831708
  99  156.11290929423786756975018931016919474653530850094292080385607815839431485039405876085737119810 6
  0901        4.1793e1       5.7234e-1    converged
57  116.22668032085755438216080431206475512732985123238322028386264231147470097947562206017603733624390
  03  157.59759181759405988753050315849876573072389951914173353824961760978555942757878278549115875949605
  5244        4.1371e1       5.8085e-1    converged
58  118.79078286597621732297913970269982434730621059280938278419371651419909632211177349955749911593215
  18  158.84998817142049872417499477554027141433508304942696625772418341154552951370883743439941376823 1
  8728        4.0059e1       5.9828e-1    converged
59  121.37012500242064591894553297049992272300131063172874230257513263573463204165139220905939384433014
  28  161.18896413759602751943734412936955436491579032747546657918809379411885842105026084484894251940 6
```

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  5622        3.9819e1       6.0725e-1    converged
60  122.946829293552588200817460330770016496214389873863517211950034915288508775882619643055311841107410
  04  163.030709687181987243311039000687994896964461416477683115209591695901795478395340394873839803340
  4313        4.0084e1       6.0930e-1    converged
61  124.256818554345767184732007966129924441573538774693561140355076913959062097289361780090901822533730
  91  165.537069187900418830038919354874797328367251745068604478953154605580406143757565518760918735563
  2005        4.1280e1       6.0315e-1    converged
62  127.516683879596495124279323766906076268088309881554982482799779300682396128525988329208783600124620
  38  167.184439978174513440957756246210378736460769242616767361106993435408969633180813043534466662149
  2677        3.9668e1       6.2476e-1    converged
63  129.578704199956050985768033906179973608640953264659431030470839998860899105116565581514917733926580
  15  169.094515415568821489505871181431834796667648580441625087382149121882334496964855342145850278397
  9980        3.9516e1       6.3136e-1    converged
64  131.087688530932656723566372461501349059203547502975045383139924407774765245620015281565491341412470
  02  169.911976479411698966699843595821792288394437125341373018541441607800841478372710528786239300457
  6384        3.8824e1       6.4112e-1    converged
65  133.497737202997586450130492042640607664974174943904675015102258855163013600784742641359287950315080
  95  173.411536519591552959846118649345595254156606634201179336822853915310940953785288490905622922080
  6028        3.9914e1       6.3795e-1    converged
66  134.756509753373871331326064157169736178396068613647164416976093173548410056831710432368804905926030
  28  174.754191523365725813378762455866917938755717620571663445611547437899715208227438017236281551273
  2138        3.9998e1       6.4039e-1    converged
67  138.116042054533443200191555190282447859835274624146235685344828568650167230430408917110945272187740
  54  176.441434297710418888892641057860933528118497108809715347612615786256857193913522497407759511109
  6424        3.8325e1       6.6311e-1    converged
68  139.736208952121388950450046523382460846790052565382603081370135410903868091485271966092903656785590
  68  178.377407776099972858309354141844261831323614612725037014890408037488465646405879270706711681797
  7740        3.8641e1       6.6429e-1    converged
69  141.123707404021123761940353818475355090300660879747620032104665095966094758718133278149341850938050
  36  179.916484020256996139340036612051237453687607553018406541300670653817390736267915996154069743098
  3965        3.8793e1       6.6632e-1    converged
70  143.111845807620632739405123868913929966233102430354632548598522957280693144133349227544427402513920
  83  182.207078484366461915407037226987798690797457778239908766630064540187844323087325321459197843117
  7580        3.9095e1       6.6844e-1    converged
71  146.000982486765518547402507596424682428975741233095803636976884966585760939594767651122740157285740
  87  184.874467848387508800960646617234258413351022911950667773178644680701353436900183004871017510537
  0110        3.8873e1       6.7722e-1    converged
72  147.422765342559602049521185010431506168772775250476830601010460812738183744326381757220541384722520
  93  185.598783677707471466527704268392646612934717649513283088919796230385127147320554259589394041627
  2722        3.8176e1       6.8678e-1    converged
73  150.053520420784880351432467236959370623037321559528200448429111275062582148497418712132422283962000
  95  187.228922583501851991641540586131243016810734603990319151464203163733848794545115882813446052138
  6350        3.7175e1       7.0212e-1    converged
74  150.925257612241466761852524678305627602426770472996717700311354953363232097863614814390781700995790
  62  189.416158656016937084852289099845324491357103023193354355419942177106017359753659221384086676202
  5454        3.8491e1       6.9206e-1    converged
75  153.024693811198896198256544255185446508590434904145506675199767563794620993781490402119952141339880
  22  192.026656360713786547283631425583430105839920297977096916289123432210211676514373034031159292250
  1129        3.9002e1       6.9228e-1    converged
76  156.112909294237867569750189310169194746535308500942920803856078158394314850394066953759133681888280
  58  193.079726603845704047402205794376054604020615810548860138504355830884413698689642278116125485263
  9657        3.6967e1       7.1792e-1    converged
77  157.597591817594059887530503158498765730723899519141733538249617609785559427583671441634735421471640
  98  195.265396679529235321463187814862250926905052452286924060110976632184393224584177152677107212859
  8038        3.7668e1       7.1465e-1    converged
78  158.849988171420498724174994775540271414335083049426966257724183411545529514040369637001185070443040
  92  196.876481840958316948622263914696207735746028691942215482823173181631971387925659830446657447282
  1788        3.8026e1       7.1411e-1    converged
79  161.188964137596027519437344129369554364915790327475466579188093794118859580350334234596847356171820
  55  198.015309676251912424919918702208867155062695438570996721534801594239284385736289544822401025207
  5792        3.6826e1       7.3054e-1    stagnated
80  163.030709687181987243311039000687994896964461416477683115209591695904079371510419876277413157840380
  06  201.264751943703788733016133427548173222402863639186734080632719799519634902481345360342979387571
  7561        3.8234e1       7.2132e-1    stagnated
81  165.537069187900418830038919354874797328367251745068604478953155064052600382918623696522291931015750
  30  202.493594514140534277686660637864315821020244899420053909069154285116329758773918885652420398098
  0615        3.6957e1       7.3872e-1    stagnated
82  167.184439978174513440957756246210378736460769242616767361112445818473526344535479056719943987457400
  44  204.189671803104554330716438386313685136534529228741907350959680217399163429174029962592076683268
```

```
    5410        3.7005e1       7.4177e-1    stagnated
  83  169.094515415568821489505871181431834796667648580441626625373166057275997726741655758953083870383 14
    23  205.394697202163286025212379390693090923722914772048407002134095417146365561509671616248006209332
    4701        3.6300e1       7.5268e-1    stagnated
  84  169.911976479411698966699843595821792288394437125341663506401800393153186774721033581168786513633 12
    26  207.906258887806209861501967907753644268659403768883999858657527509928675205265767790577210336397
    4774        3.7994e1       7.3815e-1    stagnated

  total claim and research capture time: 5.813s
```

```
C:\Users\Denise_Vella\Desktop\ronnie-andrews-2-ccm-reproduction-and-convergence-main>cargo run --release
    --features hp -p ccm-reproduction -- run --lambda-sq 250 --n-modes 400 --precision-digits 100 --displ
    ay-digits 100 --top 100
    Finished `release` profile [optimized] target(s) in 0.47s
     Running `target\x86_64-pc-windows-gnu\release\ccm-reproduction.exe run --lambda-sq 250 --n-modes 400
     --precision-digits 100 --display-digits 100 --top 100`
  runtime parallelism: Rayon workers=16, available CPUs=16, RAYON_NUM_THREADS=<unset>
CCM operator: lambda^2=250, N=400, matrix_size=801
  prime powers k <= 250: 68 entries
  precision: 100 decimal digits
  root acquisition: independent CCM discovery (indices 1..=100)
  research capture: claim (requested roots and native artifacts)
[HP] Precomputing 267 unique GL node tables (npts up to 1398, prec=397 bits)...
[HP] GL tables ready: 267 total (250 computed, 17 reused from workstation)
[HP] Computing alpha_L, beta_L, gamma_L integrals...
  cache artifact: ccm_archimedean_integrals (computed, source=workstation)
  cache artifact: ccm_prime_component (computed, source=workstation)
  cache artifact: ccm_tau_matrix (computed, source=workstation)
[HP] phase timing: tau construction/reuse=217.635s
  cache artifact: ccm_even_sector_matrix (computed, source=workstation)
  cache artifact: ccm_factorization (computed, source=workstation)
[HP] even LU factorization: computed in 3.185s
  cache artifact: ccm_weil_eigenpair (computed, source=workstation)
[HP] phase timing: Weil eigenstate construction/reuse=200.950s
[HP] eigenstate provenance: unshifted limit reached (2000/2000 steps), shifted refinement=RejectedEigenva
    lueJump, final relative Tau residual=3.821395155e-119
  cache artifact: ccm_secular_source (computed, source=workstation)
  cache artifact: ccm_root_discovery_window (computed, source=workstation)
[HP] root status summary: 100 total; 100 converged, 0 stagnated, 0 approximate, 0 failed
[HP] phase timing: root discovery/refinement=4.082s
  cache artifact: ccm_convergence_diagnostics (computed, source=workstation)
  built and solved in 423.578s, smallest Weil eigenvalue epsilon_N = 7.02402e-120

   k     computed eigenvalue        Riemann zero t_k       abs error  matching digits       status
-------------------------------------------------------------------------------------------------
   1  3.895184372413165517887665911875516924151082460208536752209189290691763306578198995547132029096907 9
    81  14.134725141734693790457251983562470270784257115699243175685567460149963429809256764949010393171 5
    6101        1.0240e1       1.4001e-1    converged
   2  5.171421579004010221186379971091325918021505052011561255940801056978565263511640505229239726754734 9
    65  21.022039638771554992628479593896902777334340524902781754629520403587598586068890799713658514180 1
    5142        1.5851e1       1.2263e-1    converged
   3  8.614120903131286498425766488742772786787328376946169995335146270798911484598978008462216921728067 3
    88  25.010857580145688763213790992562821818659549672557996672496542006745092098441644278402382245580
    6244        1.6397e1       1.8337e-1    converged
   4  10.897087286919869324561338467402993450184132772134014687598570471527767508402219000279333465524828
    63  30.424876125859513210311897530584091320181560023715440180962146036993329389333277920290584293902 0
    8911        1.9528e1       1.9258e-1    converged
   5  13.087240127644887548096596725379039920661007036137090330460153074867088236533799608967319981729136
    18  32.935061587739189690662368964074903488812715603517039009280003440784815608630551005938848496135 3
    4872        1.9848e1       2.1995e-1    converged
   6  14.134725141734693790457251983562470270784257115699243175685567460149963429809256764949010393171561
    01  37.586178158825671257217763480705332821405597350830793218333001113622149089618537264730329104945 8
    2380        2.3451e1       2.0486e-1    converged
   7  14.571038303000560261894584855010855834751235655675240385300975158534204169565177260091082358330838
    24  40.918719012147495187398126914633254395726165962777279536161303667253280528720071282996003719889 5
    4688        2.6348e1       1.9118e-1    converged
   8  17.664757667167777693466192099256725041309418493353857364916975037513408185315384168666374588819078
```

```
  53  43.32707328091499951949612216540680578264566837183687144687889368552108832230505362645634937106319093        2.5662e1       2.2746e-1     converged
   9  20.17802921306300110718622226143529051468196713919256534712300798176422260385658318430766145069479882  48.00515088116715972794247274942751604168684400114442511777531251981409021641630828133033537230540100        2.7827e1       2.3682e-1     converged
  10  21.02203963877155499262847959389690277733434052490278175462952040358759858606889079971365851418015142  49.77383247767230218191678467856372405772317829967666210078195575043351161151573927873270750740093133        2.8752e1       2.3834e-1     converged
  11  24.19230488005711333738340186631413334405420356704349829963128993749921041470360872263134232810083361  52.97032147771446064414729660888099006382501788882122477990074814031756495030418805413758782709439930        2.8778e1       2.6497e-1     converged
  12  25.01085758014568876321379099256282181865954967255799667249654200674509209844164427784023822455806244  56.44624769706339480436775947670612755278226447171663184545096984395847528027450566690301131427485239        3.1435e1       2.5422e-1     converged
  13  28.94760353150242284205581090599518585660551110638175456033388890272053908341257899066317208411404421  59.34704400260235307965364867499221903109877280646666969812245175474680015269962981183810248707463355        3.0399e1       2.9053e-1     converged
  14  30.42487612585951321031189753058409132018156002371544018096214603699332938933327792029058429390208911  60.83177852460980984425990182452400380291009045121917825710134882480849366729492053843084167039434336        3.0407e1       3.0116e-1     converged
  15  32.28423789894980865707597331776638016107357196598663055539228280109391775331685939731418988251068  24  65.11254404808160666087505425318370502934814929516672240596650108667534323266868538441677478443865947        3.2828e1       2.9742e-1     converged
  16  32.93506158773918969066236896407490348881271560351703900928000344078481560863055100593884849613534872  67.07981052949417371447882889652221677010714495174555887419666955169490121895619698353029397508583303        3.4145e1       2.9327e-1     converged
  17  34.39185527618478765818326678359251519397368234087303737650241266941742814890996186659905168670283199  69.54640171117397925292685752655473844301247420960251015732453999966338767227491041953334493317834036        3.5155e1       2.9629e-1     converged
  18  35.77314690334173418576425245288557197776993316629274590931835372737417496070644074203654219927319442  72.06715767448190758252210796982616839048090662145669708668330615148840737239960834836352533041217453        3.6294e1       2.9790e-1     converged
  19  37.58617815882567125721776348070533282140559735083079321833300111362214908961853726473032910494582380  75.70469069908393316832691676203034592281190353069740030164777530157419702770632360383403702183465280        3.8119e1       2.9799e-1     converged
  20  39.23195019075614976303805507717645107698503880124548199173927548072541559116028452214770034363580760  77.14484006887480537268266485630463701579603244923446104176523145315113916425371508940828869469973776        3.7913e1       3.0852e-1     converged
  21  40.91871901214749518739812691463325439572616596277727953616130667253280528720071282996003719889546  88  79.33737502024936792276359287711622819061324674312003087843872049710154193267709097467745199461212411        3.8419e1       3.1494e-1     converged
  22  43.32707328091499951949612216540680578264566837183687144687889368552108832230505362645634937106319093  82.91038085408603018316483749477060949750888059378214914657130628323592908635661907551256319233489682        3.9583e1       3.2110e-1     converged
  23  43.61694750040959746867403726832494460010578131638307052072871645926486239717143633655224491742285626  84.73549298051705010573531120682774141710662793424081870273552968904527172893028059879228203063995091        4.1119e1       3.1403e-1     converged
  24  45.08307470203167065169493725390149299902294594893253140039793516536350971143787386274758391932413957  87.42527461312522940653166785091921325217188640126902818645555793843969104952483075026625748079543952        4.2342e1       3.1486e-1     converged
  25  48.00515088116715972794247274942751604168684400114442511777531251981409021641630828133033537230540100  88.80911120763446542368234807950937839544489340981867504219987161881401355918219843952079327950393306        4.0804e1       3.3776e-1     converged
  26  49.77383247767230218191678467856372405772317829967666210078195575043351161151573927873270750740093133  92.49189927055848429625972524181068487872179402773064617509675048918102802605877088933786375766858864        4.2718e1       3.3549e-1     converged
  27  51.99386606891976941003313236913199104641864196474401903518641450303314560750401243990333779440706174  94.65134404051988696659792581520815393772802701565485201959247427451348210532455844076477401529960108        4.2657e1       3.4613e-1     converged
  28  52.97032147771446064414729660888099006382501788882122477990074814031756495030418805413758782709439930  95.87063422824530975874102921924678169525646122498799842052928165165110662536081792189542611557235640        4.2900e1       3.4923e-1     converged
  29  54.80712625350333936501855480513370664179273537240812051528650973757386458281487220978092102284516123  98.83119421819369223332442013862232782065803906342819610281932172756554763976555318751452832328162321        4.4024e1       3.5120e-1     converged
  30  56.44624769706339480436775947670612755278226447171663184545096984395847528027450566690301131427485239  101.31785100573139122878544794029230890633286638430089479992831871523014308272931235550890494520597719        4.4872e1       3.5371e-1     converged
  31  59.34704400260235307965364867499221903109877280646666969812245175474680015269962981183810248707463355
```

```
  55  103.725538040478339416398408108695280834481173069495764519885165794036522108301648805438145498492
  0169        4.4378e1       3.6871e-1     converged
32  60.831778524609809844259901824524003802910090451219178257101348824808493667294920538430841670394343
  36  105.446623052326094493670832414111808997282753928535138480569447114181494447575962839773554931962
  8145        4.4615e1       3.7355e-1     converged
33  63.362370096257357452289907072974429799787855323365574553073436261034914221317471068064121806071025
  22  107.168611184276407515123351963086191213476707881404765279264710421552403820978097134610774040609
  0411        4.3806e1       3.8853e-1     converged
34  65.112544048081606660875054253183705029348149295166722405966501086675343232668685384416774784438659
  47  111.029535543169674524656450309944350415345968390073056846190794765505544541759892214018861291771
  8101        4.5917e1       3.8347e-1     converged
35  65.768104115104529681448938054225117290824334813179568549219896732929636873695558424622155540393778
  13  111.874659176992637085612078716770594960311749873385873816619419619690778364405502967628940606347
  4483        4.6107e1       3.8497e-1     converged
36  67.079810529494173714478828896522216770107144951745558874196669551694901218956196983530293975085833
  03  114.320220915452712765890937276191079809917657723829892287728431041306287575852843229762049498317
  0899        4.7240e1       3.8381e-1     converged
37  69.546401711173979252926857526554738443012474209602510157324539999663387672274910419533344933178340
  36  116.226680320857554382160804312064755127329851232383220283862642311474700979475622060176037336243
  9003        4.6680e1       3.9617e-1     converged
38  72.067157674481907582522107969826168390480906621456697086683306151488407372399608348363525330412174
  53  118.790782865976217322979139702699824347306210592809382784193716514199096322111773499557499115932
  1518        4.6724e1       4.0525e-1     converged
39  73.735460487208887460952547020966423887028368971654129938918074122581971461952721292823320181106111
  38  121.370125002420645918945532970499922723001310631728742302575132635734632041651392209059393844330
  1428        4.7635e1       4.0619e-1     converged
40  75.704690699083933168326916762030345922811903530697400301647775301574197027706323608384037021834652
  80  122.946829293552588200817460330770016496214389873863517211950034915288508775882619643055311841107
  4104        4.7242e1       4.1539e-1     converged
41  77.144840068874805372682664856304637015796032449234461041765231453151139164253715089408288694699737
  76  124.256818554345767184732007966129924441573538774693561140355076913959062097289361780090901822533
  7391        4.7112e1       4.2119e-1     converged
42  79.337375020249367922763592877116228190613246743120030878438720497101541932677090974677451994612124
  11  127.516683879596495124279323766906076268088309881554982482799779300682396128525988329208783600124
  6238        4.8179e1       4.2271e-1     converged
43  80.828920034992867705588831339190962365461197261374687909076317364390627809002189432410084838377955
  41  129.578704199956050985768033906179973608640953264659431030470839998860899105116565581514917733926
  5815        4.8750e1       4.2456e-1     converged
44  82.239752209747035283225010375521771063738042945711501785370261785925587475880825000643516419439058
  01  131.087688530932656723566372461501349059203547502975045383139924407774765245620015281565491341412
  4702        4.8848e1       4.2872e-1     converged
45  82.910380854086030183164837494770609497508880593782149146571306283235929086356619075512563192334896
  82  133.497737202997586450130492042640607664974174943904675015102258855163013600784742641359287950315
  0895        5.0587e1       4.2143e-1     converged
46  84.735492980517050105735311206827741417106627934240818702735529689045271728930280598792282030639950
  91  134.756509753373871331326064157169736178396068613647164416976093173548410056831710432368804905926
  0328        5.0021e1       4.3040e-1     converged
47  85.490324974390692511329895369765000474739942324034973878553601402930855813716192866508969868906793
  36  138.116042054533443200191555190282447859835274624146235685344828568650167230430408917110945272187
  7454        5.2626e1       4.1905e-1     converged
48  87.425274613125229406531667850919213252171886401269028186455557938439691049524830750266257480795439
  52  139.736208952121388950450046523382460846790052565382603081370135410903868091485271966092903656785
  5964        5.2311e1       4.2672e-1     converged
49  88.809111207634465423682348079509378395444893409818675042199871618814013559182198439520793279503933
  06  141.123707404021123761940353818475355090300660879747620032104665095966094758718133278149341850938
  0468        5.2315e1       4.3098e-1     converged
50  90.989874773841337254782020093965406671038372600812716414705010399490011076070965691766158355364684
  79  143.111845807620632739405123868913929966233102430354632548598522957280693144133349227544427402513
  6984        5.2122e1       4.3865e-1     converged
51  92.491899270558484296259725241810684878721794027730646175096750489181028026058770889337863757668588
  64  146.000982486765518547402507596424682428975741233095803636976884966585760939594767651122740156815
  7793        5.3509e1       4.3593e-1     converged
52  94.651344040519886966597925815208153937728027015654852019592474274513482105324558440764774015299601
  08  147.422765342559602049521185010431506168772775250476830601010460812738183744326381757220541356680
  1443        5.2771e1       4.4617e-1     converged
53  95.231865075372213606828673916274801912257783470201579271715154930454098544239751364603996128117103
  21  150.053520420784880351432467236959370623037321559528200448429111275062582148497418712132282605496
  1491        5.4822e1       4.3729e-1     converged
54  95.870634228245309758741029219246781695256461224987998420529281651651106625360817921895426115572356
```

```
  40  150.92525761224146676185252467830562760242677047299671770031135495336323209786361481438887358731
  3914        5.5055e1       4.3797e-1    converged
55  98.831194218193692233324420138622327820658039063428196102819321727565547639765553187514528323281623
  21  153.024693811198896198256544255185446508590434904145506675199767563794620993781490401954749131536
  9249        5.4193e1       4.5081e-1    converged
56  105.44662305232609449367083241411180899728275392853513848056944711418149444757596283977355493196281
  45  156.11290929423786756975018931016919474653530850094292080385607815839431485039405876085737119810 6
  0901        5.0666e1       4.8872e-1    converged
57  106.28338427653172172901158737222807600217597018383988243607920333157770720431804413228176688435849
  55  157.59759181759405988753050315849876573072389951914173353824961760978555942757878275491158759496 0
  5244        5.1314e1       4.8731e-1    converged
58  107.16861118427640751512335196308619121347670788140476527926471042155240382097809713461077404060904
  11  158.84998817142049872417499477554027141433508304942696625772418341154552951370883743439941376823 1
  8728        5.1681e1       4.8765e-1    converged
59  109.38505527288847223283364699676247478658934477883057463529433565221173218883691900095588611122577
  05  161.18896413759602751943734412936955436491579032747546657918809379411885842105026084484894251940 6
  5622        5.1804e1       4.9297e-1    converged
60  111.02953554316967452465645030994435041534596839007305684619079476550554454175989221401886129177181
  01  163.03070968718198724331103900068799489696446141647768311520959169590179547839534039487383980334 0
  4313        5.2001e1       4.9626e-1    converged
61  111.87465917699263708561207871677059496031174987338587381661941961969077836440550296762894060634744
  83  165.53706918790041883003891935487479732836725174506860447895315460558040614375756551876091873556 3
  2005        5.3662e1       4.8923e-1    converged
62  114.32022091545271276589093727619107980991765772382989228772843104130628757585284322976204949831708
  99  167.18443997817451344095775624621037873646076924261676736110699343540896963318081304353446666214 9
  2677        5.2864e1       5.0003e-1    converged
63  116.22668032085755438216080431206475512732985123238322028386264231147470097947562206017603733624390
  03  169.09451541556882148950587118143183479666764858044162508738214912188233449696485534214585027839 7
  9980        5.2868e1       5.0494e-1    converged
64  116.93394413411665926695511178066483420710242486709312734832733797114103546634246785108095302345758
  39  169.91197647941169896669984359582179228839443712534137301854144160780084147837271052878623930045 7
  6384        5.2978e1       5.0613e-1    converged
65  118.79078286597621732297913970269982434730621059280938278419371651419909632211177349955749911593215
  18  173.41153651959155295984611864934559525415606606342011793368228539153109409537852884909056229220 8
  6028        5.4621e1       5.0172e-1    converged
66  120.05212898211027926872780469725888934924421425003014454257884580265372344650492905878546369057517
  27  174.75419152336572581337876245586691793875571762057166344561154743789971520822743801723628155127 3
  2138        5.4702e1       5.0442e-1    converged
67  121.37012500242064591894553297049992272300131063172874230257513263573463204165139220905939384433014
  28  176.44143429771041888889264105786093352811849710880971534761261578625685719391352249740775951110 9
  6424        5.5071e1       5.0568e-1    converged
68  122.88330077277083629242392125178645797018962610045355357522655885338718814105863064032334750869758
  85  178.37740777609997728583093541418442618313236146127250370148904080374884656464058792707067116817 9
  7740        5.5494e1       5.0709e-1    converged
69  122.94682929355258820081746033077001649621438987386351721195003491528850877588261964305531184110741
  04  179.91648402025699613934003661205123745368760755301840654130067065381739073626791599615406974309 8
  3965        5.6970e1       4.9943e-1    converged
70  124.25681855434576718473200796612992444157353877469356114035507691395906209728936178009090182253373
  91  182.20707848436646191540703722698779869079745777823990876663006454018784432308732532145919784311 7
  7580        5.7950e1       4.9751e-1    converged
71  125.08631321507505018259365543748397706373363855762456833186671663614327079313580510519861622775451
  13  184.87446784838750880096064661723425841335102291195066777317864468070135343690018300487101751053 7
  0110        5.9788e1       4.9026e-1    converged
72  127.31355192089311693589698830034280410352771201676998506174254497127167714018929361172024779125360
  04  185.59878367770747146652770426839264661293471764951328308891979623038512714732055425958939404162 7
  2722        5.8285e1       5.0302e-1    converged
73  127.51668387959649512427932376690607626808830988155498248279977930068239612852598832920878360012462
  38  187.22892258350185199164154058613124301681073460399031915146420316373384879454511588281344605213 8
  6350        5.9712e1       4.9631e-1    converged
74  129.57870419995605098576803390617997360864095326465943103047083999886089910511656558151491773392658
  15  189.41615865601693708485228909984532449135710302319335435541994217710601735975365922138408667620 2
  5454        5.9837e1       5.0044e-1    converged
75  131.08768853093265672356637246150134905920354750297504538313992440777476524562001528156549134141247
  02  192.02665360713786547283631425583430105839920297977096916289123432210211676514373034031159292250
  1129        6.0939e1       4.9847e-1    converged
76  133.49773720299758645013049204264060766497417494390467501510225885516301360078474264135928795031508
  95  193.07972660384570404740220579437605460402061581054886013850435583088441369868964227811612548526 3
  9657        5.9582e1       5.1062e-1    converged
77  134.75650975337387133132606415716973617839606861364716441697609317354841005683171043236880490592603
```

```
  28  195.26539667952923532146318781486225092690505245228692406011097663218439322458417715267710721285980380        6.0509e1       5.0881e-1     converged
 78  134.81865283975584739583901415175038040166563040692032418888263795394334967207794279554486704755477 12  196.87648184095831694862226391469620773574602869194221548282317318163197138792565983044665744728217881788        6.2058e1       5.0140e-1     converged
 79  138.11604205453344320019155519028244785983527462414623568534482856865016723043040891711094527218774 54  198.01530967625191242491991870220886715506269543857099672153480159423928438573628954482240102520757925792        5.9899e1       5.1928e-1     converged
 80  139.73620895212138895045004652338246084679005256538260308137013541090386809148527196609290365678559 64  201.26475194370378873301613342754817322240286363918673408063271979951963490248134536034297938757175617561        6.1529e1       5.1469e-1     converged
 81  139.93238440206364564375284743924058869768702115239790970016301227104588873304352625114815474574570 00  202.49359451414053427768666063786431582102024489942005390906915428511632975877391888565242039809806150615        6.2561e1       5.1011e-1     converged
 82  141.12370740402112376194035381847535509030066087974762003210466509596609475871813327814934185093804 68  204.18967180310455433071643838631368513653452922874190735095968021739916342917402996259207668326854105410        6.3066e1       5.1024e-1     converged
 83  143.11184580762063273940512386891392996623310243035463254859852295728069314413334922754442740251369 84  205.39469720216328602521237939069309092372291477204840700213409541714636556150967161624800620933247014701        6.2283e1       5.1822e-1     converged
 84  144.14184925294246421478119666439760878046464101093243084510289432827757243317169151593859285969409 38  207.90625888780620986150196790775364426865940376888399985865752750992867520526576779057721033639747744774        6.3764e1       5.1329e-1     converged
 85  146.00098248676551854740250759642468242897574123309580363697688496658576093959476765112274015681577 93  209.57650971685625985283564428988675217539078318132616246897745334620479801846773553754822881920287043704        6.3576e1       5.1805e-1     converged
 86  146.84194975078674917763902083758700328664467844035903307711176912057900431128810476757691017815257 27  211.69086259536530756390748673071929425339403098293564373621001482077714146779409413752907930940169546954        6.4849e1       5.1380e-1     converged
 87  147.42276534255960204952118501043150616877277525047683060101046081273818374432638175722054135668014 43  213.34791935971266619063912202107260882189718327663306905985370458536595880550355050241469701467071157115        6.5925e1       5.1004e-1     converged
 88  150.05352042078488035143246723695937062303732155952820044842911127506258214849741871213228260549614 91  214.54704478349142322294420107259069104559988805308307640008161991904065478778920295458025699544333293329        6.4494e1       5.2201e-1     converged
 89  150.92525761224146676185252467830562760242677047299671770031135495336323209786361481438887358731339 14  216.16953850826370026586956335449812857545371427416411097637615056594096807109292780433088981204514381438        6.5244e1       5.2025e-1     converged
 90  153.02469381119889619825654425518544650859043490414550667519976756379462093781490401954749131536924949  219.06759634902137898567725659043724124514918292701135137355787499323790953604149941733881472228158155815        6.6043e1       5.2075e-1     converged
 91  155.15549870819219228054766441455684954544425978088414137827370666166301060883214795655853440126384 75  220.71491883931400336911559263390633965676114507766196570161193204082565193747364204844913675739688788878        6.5559e1       5.2720e-1     converged
 92  156.11290929423786756975018931016919474653530850094292080385607815839431485039405876085737119810609 01  221.43070555469333873209747511927607795022233107731990937941995151378725384337307857065652700834680438043        6.5318e1       5.3021e-1     converged
 93  157.59759181759405988753050315849876573072389951914173353824961760978555942757878275491158759496052 44  224.00700025460433521172887552850489535608598994959552976295036082334543500422781639069655944653528505        6.6409e1       5.2803e-1     converged
 94  158.84998817142049872417499477554027141433508304942696625772418341154552951370883743439941376823187 28  224.98332466958228750378252368052865772090054485587426988477752547205692003915448904058160231483882400        6.6133e1       5.3173e-1     converged
 95  161.18896413759602751943734412936955436491579032747546657918809379411885842105026084484894251940656 22  227.42144427967929131046143616065963996396914832197662836489382008238968457163676034488993106875735793579        6.6232e1       5.3576e-1     converged
 96  163.03070968718198724331103900068799489696446141647768311520959169590179547839534039487383980334043 13  229.33741330552534810776008330605574008275234138781851753263649248435617726401957470246041140247161236123        6.6307e1       5.3892e-1     converged
 97  164.28382715189626643063528483386318756317438700759759814423435783368555356832553971909567306963647 41  231.25018870049916477380618677001037260670849584312337140680603034414004772200527529710772686729124002400        6.6966e1       5.3823e-1     converged
 98  165.53706918790041883003891935487479732836725174506860447895315460558040614375756551876091873556320 05  231.98723525318024860377166853919786220541983399456249648472682389683076367486389114875552443035924352435        6.6450e1       5.4297e-1     converged
 99  167.18443997817451344095775624621037873646076924261676736110699343540896963318081304353446666214926 77  233.69340417890830064070449473256978817953722775456583636301480873894015470124854736294199728532246994699        6.6509e1       5.4577e-1     converged
100  169.09451541556882148950587118143183479666764858044162508738214912188233449696485534214585027839799
```

```
    80  236.52422966581620580247550795566297868952949521218912370091896098781915038429233282626144460406 5
    1740        6.7430e1       5.4502e-1    converged

  total claim and research capture time: 423.675s
```

```
C:\Users\Denise_Vella\Desktop\ronnie-andrews-2-ccm-reproduction-and-convergence-main>cargo run --release
    --features hp -p ccm-reproduction -- run --lambda-sq 250 --n-modes 500 --precision-digits 100 --displ
    ay-digits 100 --top 100
    Finished `release` profile [optimized] target(s) in 0.41s
     Running `target\x86_64-pc-windows-gnu\release\ccm-reproduction.exe run --lambda-sq 250 --n-modes 500
     --precision-digits 100 --display-digits 100 --top 100`
  runtime parallelism: Rayon workers=16, available CPUs=16, RAYON_NUM_THREADS=<unset>
CCM operator: lambda^2=250, N=500, matrix_size=1001
  prime powers k <= 250: 68 entries
  precision: 100 decimal digits
  root acquisition: independent CCM discovery (indices 1..=100)
  research capture: claim (requested roots and native artifacts)
[HP] Precomputing 367 unique GL node tables (npts up to 1698, prec=397 bits)...
[HP] GL tables ready: 367 total (100 computed, 267 reused from workstation)
[HP] Computing alpha_L, beta_L, gamma_L integrals...
  cache artifact: ccm_archimedean_integrals (computed, source=workstation)
  cache artifact: ccm_prime_component (computed, source=workstation)
  cache artifact: ccm_tau_matrix (computed, source=workstation)
[HP] phase timing: tau construction/reuse=201.163s
  cache artifact: ccm_even_sector_matrix (computed, source=workstation)
  cache artifact: ccm_factorization (computed, source=workstation)
[HP] even LU factorization: computed in 4.785s
  cache artifact: ccm_weil_eigenpair (computed, source=workstation)
[HP] phase timing: Weil eigenstate construction/reuse=272.953s
[HP] eigenstate provenance: unshifted limit reached (2000/2000 steps), shifted refinement=RejectedEigenva
    lueJump, final relative Tau residual=3.464392111e-119
  cache artifact: ccm_secular_source (computed, source=workstation)
  cache artifact: ccm_root_discovery_window (computed, source=workstation)
[HP] root status summary: 100 total; 100 converged, 0 stagnated, 0 approximate, 0 failed
[HP] phase timing: root discovery/refinement=5.694s
  cache artifact: ccm_convergence_diagnostics (computed, source=workstation)
  built and solved in 480.793s, smallest Weil eigenvalue epsilon_N = 4.95787e-120

   k     computed eigenvalue        Riemann zero t_k       abs error  matching digits       status
-------------------------------------------------------------------------------------------------
   1  6.873735936602817810676420427960184322657975403234160650883144745459792464484206486619347074612160 6
    28  14.134725141734693790457251983562470270784257115699243175685567460149963429809256764949010393171 5
    6101        7.2610e0       2.8929e-1    converged
   2  8.029164705817879879835631155168671600964020322702861083798449876719551973239378554021237823181665 8
    52  21.022039638771554992628479593896902777334340524902781754629520403587598586068890799713658514180 1
    5142        1.2993e1       2.0897e-1    converged
   3  9.047161946343410541922634809700174242343058959793884177715902144213396222453444680015189561639844 1
    64  25.010857580145688763213790992562821818659549672557996672496542006745092098441644277840238224558 0
    6244        1.5964e1       1.9500e-1    converged
   4  10.608503286496218015150816424555619366653372495759111123329640401586084830730448100890247660900715
    27  30.424876125859513210311897530584091320181560023715440180962146036993329389333277920290584293902 0
    8911        1.9816e1       1.8620e-1    converged
   5  14.134725141734693790457251983562470270784257115699243175685567460149963429809256764949010393171561
    01  32.935061587739189690662368964074903488812715603517039009280003440784815608630551005938848496135 3
    4872        1.8800e1       2.4349e-1    converged
   6  15.615069799962870130010053756159754101264180274172627468580626723991399644988562909829110804947428
    78  37.586178158825671257217763480705332821405597350830793218333001113622149089618537264730329104945 8
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   7  17.406742175869591131835625783636222873723929699355087809495752459926497449117375347760967422991916
    50  40.918719012147495187398126914633254395726165962777279536161303667253280528720071282996003719889 5
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   8  21.022039638771554992628479593896902777334340524902781754629520403587598586068890799713658514180151
    42  43.327073280914999519496122165406805782645668371836871446878893685521088322305053626456349371063 1
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   9  21.499204986190781819674779656333150224666543362718716658693127343997443887269918569065807887574648
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11  28.576411916685211929065730918747050136119581209275828785714313556648830812543736106863946876273427
  93  52.970321477714460644147296608880990063825017888821224779900748140317564950304188054137587827094 3
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13  31.830838001775288879240605956985168502413085180751349515573330610935800513406161738642364163690582
  59  59.347044002602353079653648674992219031098772806466669698122451754746800152699629811838102487074 6
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14  32.935061587739189690662368964074903488812715603517039009280003440784815608630551005938848496135348
  72  60.831778524609809844259901824524003802910090451219178257101348824808493667294920538430841670394 3
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  84  67.079810529494173714478828896522216770107144951745558874196669551694901218956196983530293975085 8
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17  40.918719012147495187398126914633254395726165962777279536161303667253280528720071282996003719889546
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  73  75.704690699083933168326916762030345922811903530697400301647775301574197027706323608384037021834 6
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  00  77.144840068874805372682664856304637015796032449234461041765231453151139164253715089408288694699 7
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  30  84.735492980517050105735311206827741417106627934240818702735529689045271728930280598792282030639 9
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 total claim and research capture time: 480.886s
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