

Supplementary data file 8 "Ana7120 tRNAs".

The tRNA transcriptome of *Anabaena* 7120.

Transfer RNAs are housekeeping genes usually expressed constitutively at high levels. Therefore it is of interest to identify their promoters in order to define a consensus constitutive promoter. This could also help in the design of promoters for the engineering of high level expression of genes of interest in Cyanobacteria. tRNAs are transcribed as 5'-extended precursors that are rapidly processed by RNase P, and the 5' leader fragments generated by RNase P are degraded. Processing is very fast, and precursors or 5' leaders are not easily detectable by northern blot hybridization. Standard procedures to identify the 5' ends of RNAs such as primer extension or nuclease protection assays usually identify the 5'-end of the mature tRNA but not the authentic TSS. Therefore only very few TSS for tRNA genes have been identified experimentally so far.

Because of the high sensitivity of the dRNA-seq procedure here sufficient numbers of reads were obtained to unambiguously identify TSS for most tRNA precursors (see list at the end of this file). Only for a small number of tRNAs no TSS was identified. Some of these are probably cotranscribed from upstream genes (tRNA-Arg-CCT, tRNA-Thr-GGT, tRNA-Arg-CCG) or are transcribed within ribosomal operons (tRNA-Ala-TGC and tRNA-Ile-GAT). Others with no upstream reads detected (tRNA-Val-TAC, tRNA-Thr-TGT) might be processed too quickly to accumulate enough precursors for detection in dRNA-seq.

A total of 37 TSS were identified for 35 tRNA genes. Two genes have two TSS. From the aligned TSS a consensus -10 sequence could be found at 5-8 bp of

TSS (**Figure S2A**). A -35 sequence is found in most tRNA genes at 17-19 bp from the -10 sequence. In two cases the distance is only 14 bp and in another it is 22 bp, therefore their relevance is doubtful.

The length of 5'-leader sequences can be as short as 5 nt and longer than 200 nt, but most are between 10 and 20 nt (**Figure S2B**).

One of the two tRNA-Asn-GTT encoded in the chromosome, *trnN-GUU(1)*, has a long leader (162 nt) and there is an asRNA that fully overlaps its promoter. This asRNA is *hetR*-dependent but independent of nitrogen status.

Overview on tRNA dRNA-seq data

Sequences upstream from mature tRNAs in green, TSS in red, mature tRNA in black.

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>640697052 tRNA-Pro-TGG [Anabaena sp. PCC 7120: NC_003272] (+)strand
TATGTTTTGGTATCCTCATTAAATTTTTCCGCTAAAGAAACATAGCCAAT
ATCTAAAAAATCAGCTATGATAGCTAAAGCTTGTGTGAATAAAGTGAAAT
CGGGATGTAGCGCAGCTTGGTAGCGCGCCTGCTTTGGGAGCAGGATGCCG
CAGGTTCAAATCCTGTCATCCCGA
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>640697053 tRNA-Leu-CAA [Anabaena sp. PCC 7120: NC_003272] (-)strand
GATACTAGTTTTCTGCATTTGTAAGTAGGTAGAGGAGAATTTTAATTTAT
TCCTTGCATTAAGCTTAATTGCTGTACTATAAATTGTGAAAGTTGCCTCCAA
GGCGGGTGGCGAAATTTGGTAGACGCACCACACTCAAATGTGGCGACCT
TGCGGTCATAGGAGTTTCGATTCTCCTCCTGCCCCA
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>640697054 tRNA-Leu-CAG [Anabaena sp. PCC 7120: NC_003272] (+)strand
CATCATGACTCAACAGATTGCCTGCAAAATCTTTCCTGGCAAAGTTGACA
GGCTTAAATAATTAAGCAATAATAAGAAATTGTCGATATGCACACCGCAA
GCGGAACTGGCGGAATTTGGCAGACGCGCTAGATTCAGGTTCTAGTGCCGC
AAGGCTTCCGGGTTCAAGTCCCGGGTTCCGCA
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>640697055 tRNA-Arg-CCT [Anabaena sp. PCC 7120: NC_003272] (-)strand
ACACAGTTATCTTTGTGGTTTAGAAATAGGTGGTGATTCTTGGAGCAATT
CTTGGCAGTCTAGTTAGAATACTGCTATCATTGTATATGCTTCACAGTT
GGGGCTGTAGCTCAGTTGGATAGAGCGAGCGCCTCCTAAGCGCTAGGTCG
TGCGTTCAAGTCGCACCAGTCCCG
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No TSS detected. Probably cotranscribed with upstream gene (*all0245*)

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>640697056 tRNA-Ala-TGC [Anabaena sp. PCC 7120: NC_003272] (+)strand
TATAAAATGCAGCAACGATTTGCGTATTTTCTTGGTTTCATCCCTTTGTAA
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AAAACAGAGTTTTTCGGTTATGATAGCGGAGACTAATAAATTCAATTTTAC
GGGGGTTTAGCTCAGTTGGTAGAGCGCCTGCTTTGCAAGCAGGATGTCAG
CGGTTTCGAGTCCGCTAACCTCCA

>640697057 tRNA-Val-TAC [Anabaena sp. PCC 7120: NC_003272] (-)strand

AGGGCATTTACAAGCTTCTCAAAAATACTTAAAAAAATTTTCCTCAAAAT
ACTAGCGCGATTCAAAAATATTTTGCTATATTGATTGTTAGTGAAATGAAC
GGGCGGTTAGCTCAGTTGGTAGAGCGCCTGCCTTACAAGCAGGATGTCAT
CAGTTTCGAGTCTGGTACTGCCCA

No TSS detected

>640697058 tRNA-His-GTG [Anabaena sp. PCC 7120: NC_003272] (-)strand

TTTGCATTCCCAAGACTCTCAATCAGTAAAGTCCGTTCCCTCACAAAAAAA
AAATTCTGGATAAGTTTACTAAACAGGTGCTATAATAAAGAATGTGTGTG
GCGGGCGTAGCCAAGTGGTTAAGGCAGTGGATTGTGGTTCCACCATTCCGG
GGGTTCAAGTCCCCTCGTTCGCC

>640697059 tRNA-Asn-GTT [Anabaena sp. PCC 7120: NC_003272] (+)strand

TTATCAGTGTTCGGTTAGTGATTAGTCCACCAGGGGGAGACGGTCTAGT
TTAATACTTAGACTACCGCCTTAAATTTTCCTATGCTACATTGGGTTACA
AGATAGTAATACATTTGCCGAGCTATGGTTTGGGTTCTGTATACCCGACT
GGTGCGCCAACCTCTGGATTGAGCGTATACCGCAAAGTAATAAGTTACTA
TTTTACCCCGTTTGATAAGGTCAGTGGCAGAGCCGATAAAGCTTATGCTA
CATCAAACACAC

GAAAGTTAGCTCAGTGGTAGAGCGATCGACTGTTAATCGATATGTTGTA
GGTTCAACTCCTATACTTTCT

Long leader, HetR-dependent

>640697060 tRNA-Phe-GAA [Anabaena sp. PCC 7120: NC_003272] (-)strand

AGTTGTACTTCAAGGCAGCATAAATCTTTTTTTTACGAAAATTTTCCGACCT
AATCGTTTTATGTTTGGCTACATTGATTAATCGTGGTCAAGAAAAAACAA
GCCGGGATAGCTCAGTTGGTAGAGCAGAGGACTGAAAATCCTCGTGTAC
GAGTTCAAGTCTCGTTCCCTGGCA

>640697061 tRNA-Glu-TTC [Anabaena sp. PCC 7120: NC_003272] (+)strand

GTGAGAATTCCCTTCTTCTGTCCCAAGCCGAAAATTTTTTTTCCCGACCT
ATTGACATCACCTGAAAAATCCGTTAATTTATAAAAAGTCTGAGGTTGAT
GCCCCATCGTCTAGAGGCTTAGGACACCTCCCTTTCACGGAGGTAACGG
GGATTCGAATTCCCCTGGGGGTA

>640697062 tRNA-Leu-GAG [Anabaena sp. PCC 7120: NC_003272] (-)strand

TATATTTAGCAAGATAAATTTTCATAAAGTTTGGCAAATATAGTTTTTAC
CTTGTTTTATGCAATTTTTTTGTGCTAGTATATCTTCGTGTACAACCCGT
GCGGATGTGGCGGAATTGGTATACGCGCACGCTTGAGGTGCGTGTGGCTT
TGCTTGCAGTTCGAGTCTCGCCATCCGCA

>640697064 tRNA-Arg-TCT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 AGCCTTGCATCGGTAAATCTGCAATTTTTTGGTTGCTTCTTATGAAAGA
 AAACGATATAATTACCTG^GATGACTCCTATGGGAGCCTGAGTATTA^ACTT
 GGGCGCTAGCTCAGTGGATAGAGCCACGGATTTCTAATCCGTTGGTCGC
 AGGTTCGAACCCTGCCGCGCTCG

1 read

>640697065 tRNA-Tyr-GTA [Anabaena sp. PCC 7120: NC_003272] (+)strand
 GCACTTACTACAAACTCTTTTTGGTGTCTCCAAAAATTTTTTATTACCC
 ACTTGCCATTTCTAAAAATACGCTGCTATTATTGTAAAT^TCGTGGGACATAC
 GGGTCGGTGTCCGAGTGGTTAATGGAGACGGACTGTAAATCCGTTGGTTT
 ACACCTACGCTGGTTCAAATCCAGCCCGGCCA

>640697066 tRNA-Thr-GGT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TTGGTTTACACCTACGCTGGTTCAAATCCAGCCCGGCCACCTTCAATTT
 TAGATTTTGAATTATAACCTAGTTCAAAATCTAAGATTTAAATAAATTTT
 GCCCGTGTGGCTCAGTGGTAGAGCACACCCTTGGTAAGGGTGAGGTCACG
 AGTTCAATCCTCGTCACGGGCT

cotranscribed with upstream tRNA^{Tyr}

>640697067 tRNA-Gly-CCC [Anabaena sp. PCC 7120: NC_003272] (-)strand
 GCTGCACGTTTTGTATAAGAGATTGTGCCAACACATAATGGAAATGCAGA
 TATTATCTACACTGCAAAAAATAGTGTATAATTCTACCT^GTGCTGTTAAT
 GCGGGCGTAATTCAGTGGTAGAATGTCACCTCCCAAGGTGAACGTCGTG
 GGTTCGAGTCCCATCGCCCGCT

>640697068 tRNA-Gln-TTG [Anabaena sp. PCC 7120: NC_003272] (-)strand
 CACAAGGCTTTACAGCACTTATTACTTAGTTCAGAAATTTTTTTCAAAGT
 ACTTGACATATCCCCTACACAGACTGCTATATTAATAAA^GTCGAAAGCTT
 TGGGGCGTCGCCAAGTGGTAAGGCATCGGGTTTTGGTCCCGACATCCCTA
 GGTTCGAATCCTAGCGCCCCAG

>640697069 tRNA-Pro-CGG [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TCCCGTTCCGATTCATCTATATATAATATATAGATG^TAGATATCTTTTCG
 GTATTGACTATTATTTATGTTATGCTAAGGGGG^GCCGTATAATTTTTTTAA
 CGGGATGTAGCGCAGCTTGGTAGCGCACTTCGTTCTGGGACGAAGGGGCCG
 CTGGTTCGAATCCAGTCATCCCGA

Heterogeneous TSS? Few reads

>640697072 tRNA-Ile-GAT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TGAGAAATCGAAAGCGTAAAGCGAATAGAGGAACAGATGGTCTACTCTAGG
 TCGGTTCGTAGATATTGTCAAAGCTTTCAA^ACTATGATTTGGTTCGATAAT
 GGGCTATTAGCTCAGGTGGTTAGAGCGCACCCCTGATAAGGGTGAGGTCC
 CTGGTTCGAGTCCAGGATGGCCCA

>640697073 tRNA-Ala-TGC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TCCAGGATGGCCACCTGAAGCAAGTCAA^AAGTTAAAGACAAAAGTCAA

AAGTAGTTATTTACTTTTTGAATTTTGGATTTTGAATTTTGAATTGTATTT
 GGGGGTTTAGCTCAGTTGGTAGAGCGCCTGCTTTGCAAGCAGGATGTCAG
 CGGTTTCGAGTCCGCTAACCTCCA
ribosomal operon

>640697077 tRNA-Ile-GAT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TGAGAAATCGAAAAGCGTAAAGCGAATAGAGGAACAGATGGTCTACTCTAGG
 TCGGTTCGTAGATATTGTCAAAGCTTTCAAACATGATTTGGTTCGATAAT
 GGGCTATTAGCTCAGTGGTTAGAGCGCACCCCTGATAAGGGTGAGGTCC
 CTGGTTCGAGTCCAGGATGGCCCA

>640697078 tRNA-Ala-TGC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TCCAGGATGGCCACCTGAAGCAAGTCAAAAGTTAAAAGACAAAAGTCAA
 AAGTAGTTATTTACTTTTTGAATTTTGGATTTTGAATTTTGAATTGTATTT
 GGGGGTTTAGCTCAGTTGGTAGAGCGCCTGCTTTGCAAGCAGGATGTCAG
 CGGTTTCGAGTCCGCTAACCTCCA
ribosomal operon

>640697081 tRNA-Arg-CCG [Anabaena sp. PCC 7120: NC_003272] (-)strand
 CATCTGCATTTTGAAGTTCGTCGCAATGGTACACCAGTCAACCCAGCAGA
 TTATCTTTAGCCAAAAATCTTCTGGAGCATGATATAATTAGCCAGTACGA
 GGGCGCGTAGCTCAGTGGATAGAGCAACAGATTCCGGTCTGTGGGTCGG
 GGGTTCAAATCCCTCCGCGCTCG
 No TSS detected. Probably cotranscribed with upstream gene (*asl2362*)

>640697082 tRNA-Leu-TAG [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CTCGTGTAGGCGTGATGTGATTGTTACGAATTTTTAACTAATACCTATTA
 TCTATTGCCTATTCCCTGAGATAAAGTGCTATACTAGTATAGTTGCATAA
 GCCGATGTGGCGGAATTGGCAGACGCGCTAGATTTAGGTTCTAGTTCCGA
 GAGGAGTGAAGGTTCAAGTCCTTTCATCCGCA

>640697083 tRNA-Ala-GGC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CCCATGTTATTTATATTAAGGATGATTCTATTGCATCCACATTTGTCAAACCCATTTACA
 CTAGGTATTTACCATTTGCGGATGAGTCTAATATAATAAGCATTATGCTAATGTACATAA
 GTTTTAATAATGTTAAGTATTTATAAATAAGTAATACTTGGTTTAAATTGCTCGATTAT
 GGCATACAATGGCAGAATGCCATAAAAAATAAAAAATAAATTTAAAAGTTAATTC
 GGGGTTATAGCTCAGTTGGTAGAGCACTTCAATGGCATTGAAGGGGTCAG
 CGGTTTCAATCCGCTTAACTCCA
Long leader

>640697084 tRNA-Lys-TTT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 ACAAAGCATCTGTAAGATTGTCGGCAAGTTTTTCTAAAAACCCTTTACA
 AGTCTACGGTTGTTTATGCTATGATGGCAAAAGTTGCGAAACAAACCGCAA
 GGGTCGCTAACTCAACGGTAGAGTACTCGGCTTTTAAACCGATTAGTTCCG
 GGTTCGAATCCCGGGCGACCCA

>640697086 tRNA-Val-GAC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TGAAGGGCAAAGACTACTGGCTTTGGCGCAGAAGCGACTGAAACAATAAA
 ACTTTGCTTTTATGAAAAATGTGTGTTACTGTTATAAA^TCGTGTGGTTAA
 GGACGTATAGCTCAGTTGGTTAGAGCGCTACGTTGACATCGTAGAGGTCA
 CTGGTTCGAATCCAGTTACGTCCA

>640697087 tRNA-Ser-GGA [Anabaena sp. PCC 7120: NC_003272] (+)strand
 TCGGGATTTTGATTGGGACTTTCAGATTGCTCTAAAAAATTTCTTTCTTT
 ATCTTTGCATTTTTTTAGAGTTTCAGCGTACAATAGTAA^TCGTGACATCT
 GGAGAGATGGCCGAGTGGTTAAGGCGCAGACCTGGAAAGTCTGTAATGC
 GGAAACGTATTCTAGGGTTCAAATCCCTATCTCTCCG
TSS further upstream antisense to ferredoxin

>640697088 tRNA-Ser-CGA [Anabaena sp. PCC 7120: NC_003272] (+)strand
 GGAAAACCTCAGCATCAAATTCATTACAGGGTCATGTTTTGAGTTTTCCCATAGTCA
 AGACTTCTCTAACAACTTGTTAAATGCTATTATTTTGT^TCGGAAAAC TGAGCTTAGTCAT
 TTCCGATTGCTAGCGATGGGTAGGTGATCGCTTCACCTAACGAGATGCTATCATGACAAA
 AGGAAAAC TCTGTATCAACAGTTTCCTAAATGAATAAATATCT
 GGAGAGGTGTCCGAGTGGTTGATGGTGACGCACTCGAAATGCGTTAAGGA
 TGCAAGTCCTTCGGGGTTCAAATCCCCCTTCTCCG
Long leader

>640697089 tRNA-Asp-GTC [Anabaena sp. PCC 7120: NC_003272] (-)strand
 CGTAAATCCTAGAAGTTCAAATCTGAGCTAAAAAGGAAATTTTCATAAATA
 AGGTTGACAAATCCTTGGAGGTTTCGTCATAATAGGG^AAGTTGCCAATTAA
 GGGACTGTAGTTCAATTGGTTAGAGCACCGCCCTGTCACGGCGGAAGTTG
 CGGGTTTCGAGCCCCGTCAGTCCCG

>640697090 tRNA-Arg-ACG [Anabaena sp. PCC 7120: NC_003272] (-)strand
 TGCCGTGCCCTGGCCATCTAGATGAGTAAGGTTTGCAGAAATTTTTGGGAA
 AAGGGGCTTGATAATTAGGAAAAATGGTGATAGTATATATTT^CTTGTAA
 GGGCGTGTAGCTCAGTTGACTAGAGCACGTGGCTACGGACCACGGTGTCTG
 GGGGTTTCGAATCCCTCCTCGCCCCG

>640697091 tRNA-Gly-TCC [Anabaena sp. PCC 7120: NC_003272] (-)strand
 GCCGTTATTAAGATATGTTTTTGGTATGAGCTTCAGTGCAAATCTGTATTCATTATTGTGGTTTGCAC
 CTTAGTAGATTTTCTGCTATACTTGTCTG^AAGTTTCATACATAAAGACCTACAAAGCAATAGAAAATCATGT
 CTATTGCTTAAACCGAGCTTATGTATCGGGTTACGGCTTCAATAACTGAAGCGTTGTTAGC
 GCGGGCGTAGTTT^TAGTGGTAAAACTATAGCCTTCCAAGCTATTAATGCGG
 GTTCGATTCCCGCCCGCCGCT

>640697092 tRNA-Ala-CGC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 AGAATTTCCGGCGATCGTGAGTGAGTGTTAAGATATTGTCT^GATAGTATG
 GCGTTGATTAGGTAAGCATAGTTTGTATCAACTTACCATTTCAGCTATCTAA
 GGGGAATTAGCTCAGTTGGTTAGAGCGCTGCGATCGCACCGCAGAGGTCAG
 GGATTTCGAGTTCCCTATTCTCCA

promoter overlaps upstream gene

>640697093 tRNA-Thr-CGT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CCATCTCTGCTTTCAGGCGGGCATATTGTTTCAGGATTCAAACGCTTTTTG
 GGATTAGGTTCTACCATAAGTAAATAATGCTATAATCTCTTATCGTATAT
 GCCGATGTGGCTCAGTGGTAGAGCAGCTGATTCGTAATCAGCAGGCCGTG
 GGTTCAAATCCCATCATCGGCT
Heterogeneous TSS

>640697094 tRNA-Gly-GCC [Anabaena sp. PCC 7120: NC_003272] (+)strand
 GTCCATTGATTAGTCTCCAGCCCTCAGTTAGCAAAATTTACAAGTTTAA
 ACAGTTGACAAAATAAAAATTAATCTGGCATATTTAGATATAGTGAAGTTT
 GCCGGTATAGCTCAGTGGTAGAGCGTCACCTTGCCAAGGTGAATGTCGCG
 CGTTCGAATCGCGTTACCCGCT

>640697097 tRNA-Ala-TGC [Anabaena sp. PCC 7120: NC_003272] (-)strand
 TCCAGGATGGCCACCTGAAGCAAGTCAAAAGTTAAAAGACAAAAGTCAA
 AAGTAGTTATTTACTTTTGAATTTTGGATTTTGAATTTTGAATTGTATTT
 GGGGGTTTAGCTCAGTTGGTAGAGCGCTGCTTTGCAAGCAGGATGTCAG
 CGGTTGAGTCCGCTAACCTCCA

>640697098 tRNA-Ile-GAT [Anabaena sp. PCC 7120: NC_003272] (-)strand
 TGAGAAATCGAAAAGCGTAAAGCGAATAGAGGAACAGATGGTCTACTCTAGG
 TCGGTGCTAGATATTGTCAAAGCTTTCAAACCTATGATTTGGTTCGATAAT
 GGGCTATTAGCTCAGTGGTTAGAGCGCACCCCTGATAAGGGTGAGGTCC
 CTGGTTCGAGTCCAGGATGGCCCA
ribosomal operon

>640697101 tRNA-Met-CAT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CCAGGCAAATACACGCGTTTAGAGGTTGTTGGAGAAATTATCGCTTTTATA
 GTTGCCAAACTTTTGGAGTTTGGGTTATACTTGAAAAGTCAAGAAAAACGA
 CGCGGGATAGAGCAGCCTGGTAGCTCGTCGGGCTCATAACCCGAAGGTCA
 GTGGTTCAAATCCACTTCCCAGCA

>640697102 tRNA-Asn-GTT [Anabaena sp. PCC 7120: NC_003272] (-)strand
 GAAATAATCTAGATAAGAAAGCTACTGGAAAATTTTTTTTGCAAAGTAC
 TTGCCATATCCTATCGACTACGATAATATTATAAAATCGTGAGAGCAACGT
 TCCTCAGTAGCTCAGTGGTAGAGCGATCGACTGTTAATCGATTGGTCACT
 GGTTCGAATCCAGTCTGGGGAG

>640697103 tRNA-Met-CAT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 AACTACGCTTACTTATATCAAGCAACCAGAGAAAATTCATTTCCCAGAAT
 ACTAGACAAAAATAAAATTTATCAGCTATATTAAGAAAATGTGTGAAAACAC
 GGCTCAGTAGCTCAGTGGTTAGAGCACGGGACTCATAAGCCTGGGGTTCG
 TTGGTTCAAATCCGACCTGAGCCA

>640697104 tRNA-Pro-GGG [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CTGCTGTACCTAGTCTGTTGCAAGCTACGGGAATGCTCAAAGTTTTTTTGA
 ATTTACCCCTTGATTTTACAAAAGCGTTTGCATAATATAGTAATTCTGAC
 CGGGGCGTAGCGCAGCTTGGTAGCGGCCACTTTGGGGTAGTGGAGGTCG
 TGGGTTCGAATCCC GCCGCTCCGA

>640697105 tRNA-Ser-TGA [Anabaena sp. PCC 7120: NC_003272] (+)strand
 CCAGTAGTACCATCTGTGTAGATGATAGGATATAGTATTATCTGTCAGCT
 TTATTGCTCACCCACAAAAACAGGGTGGCAGTGGCTCGACAGTTTATTT
 GGAGAGGTGGCAGAGTGGTCGAATGCACTCGACTTGAAATCGAGCGAGGC
 GAAAACCTCCGGGAGTTCGAATCTCCCCCTCTCCG

>640697106 tRNA-Leu [Anabaena sp. PCC 7120: NC_003272] (-)strand
 CTGAACTGAAAGCCTGGAGACACCATAAATATTGGGCTTTTAAATGAGTCCAGCAAAAATTCCTGATTCT
 TGCTGATCAAAAATTATAAGATAATGCTACAATGGCAAAGCCAGTAAAGAAGTAGTGTCTTGTCCGGGCAA
 GATTGAAGATGCTAAGTCTAGTTAAATGCGAGGAAGCAAATGCAACTCTCAGCTAGCTACAGCTAATTTCC
 CCAGGGGAGATAAAAAATTTTTCATCTAGTTGGACAAAATACGCATTTAATGGTGAATATATGAGGGGG
 TATTTGCTGCCTCCAAAATATAACAAGCTCCCAGCACAATGG
 GGGGGTGTGGCGGAATGGTAGACGCTACGGACTTAAATAATTGAGCCTTA
 GAGAAGAAATTCCTTAAGTGGATGCTCTCAAACCTCAGGGAAACCTAAATC
 TAGCTATAGACAAGGCAATCCTGAGCCAAGCCGAAGTAGTAATTAGTAAG
 TTAACAACAGATAACTTACAGCTAATCGGAAGGTGCAGAGACTCGACGGG
 AGCTACCCTAACGTC AAGACGAGGGTAAAGAGAGAGTCCAATTC TCAAAG
 CCAATAGGCAGTAGCGAAAGCTGCGGGAGAATGAAAATCCGTTGACCTTA
 AACGGTTCGTGTGGGTTCAAGTCCCTCCACCCCCA

Group I intron

>640697107 tRNA-Thr-TGT [Anabaena sp. PCC 7120: NC_003272] (-)strand
 CCCTTCCACCAAGCCAAAATTAAGTTGCTCTAGAGGTAGACAAATAAATTA
 CTTGTGATATAAATTA AAAATCGGTAAGTGC GTTAAAGCAATTACTGAGTT
 GCCAGCATAGCACAGTGGTAGTGCATCCGACTTGTAAATCGGAAGGTCGTC
 GGTTCAAATCCGACTGCTGGCT

no TSS detected

>640697111 tRNA-Met-CAT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 GTTCCCCTATTCCATAAATTA AATGATGTAGTATAAAAATCTAATAAATT
 ATCTTAGAAGGTACACAAGCTTTACACTCTAAGATACAATTGTAAACTAA
 CCAGGGTTGCGCGAGCGGTTGAGGCAGCGAACTCATAATTCGCCCAAGGC
 AGGTTCAAATCCTGCACCCTGGA

ambiguous

>640697112 tRNA-Lys-CTT [Anabaena sp. PCC 7120: NC_003272] (+)strand
 AGAGTGGTCATGGTCAAACCACTTTTATAATCAGATTTCCCGGCTCACTC
 AGCTAAATCTTGGCAGAACTACAGAATTTTGTTAATATAGTGATTGGTGT
 GGGTGA CTAGCTCAACGGTAGAGCAGTAGACTCTTAATCTATTGGTTGCG
 GGTTCAAATCCCTCGTCACCCA

>640697113 tRNA-Trp-CCA [Anabaena sp. PCC 7120: NC_003272] (+)strand
CATCTGCCGCTAGTTACCTCGACAAAACCTATGGTAGAATGGTAATCTAGT
TACGTTAGACTAAAAAAGTTTGACATAAACTAAAATCAAGCCAGCTTGT
GCGCTCTTAGTTCAGTTGGTAGAACGCAGGTCTCCAAAACCTGATGTCGG
GGTTCAAGTCCCTCCAGGGCGCG

>640697114 tRNA-Cys-GCA [Anabaena sp. PCC 7120: NC_003272] (-)strand
TCACTATGCTTTGAAAACCTCCACTAGCAATAGCAAAATTTTTGCAACTTG
GGGATGCAAAACAAAGCAAACCTATGCTATGATAGTTGACTGTAGAGTGC
GGCGGCATAGCCAAGTGGTAAGGCAGAGGTCTGCAAAACCTCCATCCCCC
GGTTCAAATCCGGGTGCCGCCT