

## Exact Pairing (by numerical matrix diagonalization). George F. Bertsch

The wave function is represented by the pair occupation numbers of the doubly-degenerate orbitals,  $n = 0$  or  $1$ . The number of doubly-degenerate orbitals is  $\Omega$ , and the number of pairs is  $N$ .

1. The first program, `bitplay2.py`, sets up the information about the space:
  - number of configurations
  - list of configurations
  - list of matrix indices corresponding to pair jumps.

```
$ python bitplay2.py < $\Omega$ > < $N$ >  
output list is t.dat
```

example:  $\Omega = 8$   $N = 2 \longrightarrow$  28 configurations, starting with  $\vec{n} = (1, 1, 0, 0, 0, 0, 0, 0)$

2. The second program, `Hpair_14.f`, sets up the Hamiltonian matrix using the output of `bitplay2.py` and a file containing the single-particle energies and the pairing interaction matrix elements. The script `do_it.sh` in `example.8.4/` carries out the steps. The correlation energy should be  $-2.50904$ , on the last line of the output



3. Another program, `plb2.f`, can handle large matrices. The example for this one is an exact diagonalization of the pairing in  $^{117}\text{Sn}$ , with Hamiltonian energies calculated in `ev8`. It requires two items of input data on `sysinput`: `Nlan`, the number of Lanczos iterations, and `scale`, a scaling factor on the pairing interaction. The expected output is in `plb2.out`.