1. Progress Report on Individual Codes
   Coh, Empire, Mcgnash, Talys

2. Development of the MODLIB library:
   Goal, Status, and Future

Notes on the Subgroup A Meeting on May 25, 2004
Three main groups collaborating (Europe & USA):

- **Talys** (NRG & CEA)
- **Empire** (BNL + IAEA collaboration)
- **McGnash + CoH** (LANL)

*In addition to developing new validated and standardized reaction modeling codes, Subgroup A provides a useful framework for collaborative work and exchanges between these 3 projects.*
**COH**

_T.Kawano (LANL) / C, Perl / Under development_

Characteristics: coupled-channels calculations available for the entrance channel RIPL2COH interface

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**EMPIRE**

_**M.Herman et al. (BNL) / F77 / Stable (2.18)**_

_(R.Capote, P.Oblozinsky, M.Sin, A.Trkov, A.Ventura, V.Zerkin)_

Characteristics:

- Major nuclear reaction mechanisms included
- Comprehensive library of input parameters based on RIPL-2
- Powerful graphical interface and plotting capabilities against exp. data
- **Under development**: exclusive spectra, sophisticated fission channel, photo-nuclear reactions, exciton model for cluster emission, ...
Progress Report on Individual Codes - II

**McGNASH**  
P.Talou, M.B.Chadwick (LANL) / F95, Perl / Under development

**Characteristics:**
- GNASH “heir”; most important features from GNASH already in place.
- Use of the DDHMS code for preequilibrium phase.
- Inclusive and Exclusive spectra. Width fluctuation corrections.

**TALYS**  
A.Koning (Petten), S.Hilaire (CEA), and M.C.Duijvestjn (Petten) / F77 / To be released at ND2004, Oct. 2004.

**Characteristics:**
- Very complete. Latest nuclear models for direct, compound, pre-equilibrium and fission reactions.
- Calculation of most physical quantities of interest.
- Automatic link to RIPL database. Automatic ENDF-6 formatting.
- Exclusive spectra, prediction of fission fragment distribution with the Brosa model, merging of ENDF evaluated files with TALYS results, etc.
- Under development: (“Chadwick”) model for recoils, transfer to F90, final manual, and official publication of the code.
ModLib

A library of Fortran 95 modules for nuclear reaction codes

Goal: constitute a library of well-tested and well-documented modules to be used in existing and future nuclear reaction codes.

Advantages:

- Avoid duplication of work
- Simplify inter-comparison of codes
  (act as a reference on which everyone can agree upon)

Get the BEST CODING AND PHYSICS EXPERTISE into a public library

Coding in modern Fortran 95 - very good for building libraries!
Can already be used in existing F77/C codes (e.g., EMPIRE and TALYS)
ModLib

Status and Beyond

What has been done:

- Structure, hierarchy of the library
- Coding rules and Header template
- Submission rules, standards (Makefile, archive, sample case, ...)
- Web site, mailing lists, ...

Organization

Basic: **Accuracy** (e.g., real kind), **Constants** (fundamental constants)

Physics:

- **Level Density** Representation (Gilbert-Cameron),
- **Gamma-ray Strength Function** (Giant Dipole Resonance),
- **Width Fluctuation Correction Factors** (HRTW, Moldauer, GOE),
- **Pre-equilibrium DDHMS model** (Chadwick-Blann)

ENDF:

- **CHECKR**, **FIZCON**, **STANEF**, **INTER**, **PSYCHE** (Dunford)
ModLib

In the Working...

Organization

- Modules testing,
- How to best use the library,
- New web site and FTP server,
- ...

Existing Modules:

Extend the existing modules to include State-of-the-Art physics models.

New Modules:

To be discussed at the May 25th meeting.
Timeline

**Milestone:** MODLIB V.1.0 by the end of ‘04

- Library file: libmodlib.a, so that > f90 -lmodlib ...
- Contains 7 modules (+ ENDF processing codes)
- / Accuracy / Constants / Level_Density / Definitions / Width_Fluctuations / G-rays Str. Fct. / (STANEF, CHECKR, ...) / Numerical_Tools (GSL) / RIPL-3?
- Testing in “Mother Codes”

** Longer Term:** NEW MODULES 1-2 years

* Pre-equilibrium code DDHMS [MCGNASH]
* Kalbach cluster emission [TALYS]
* Specific level densities [EMPIRE]

& Testing, benchmarking of modules