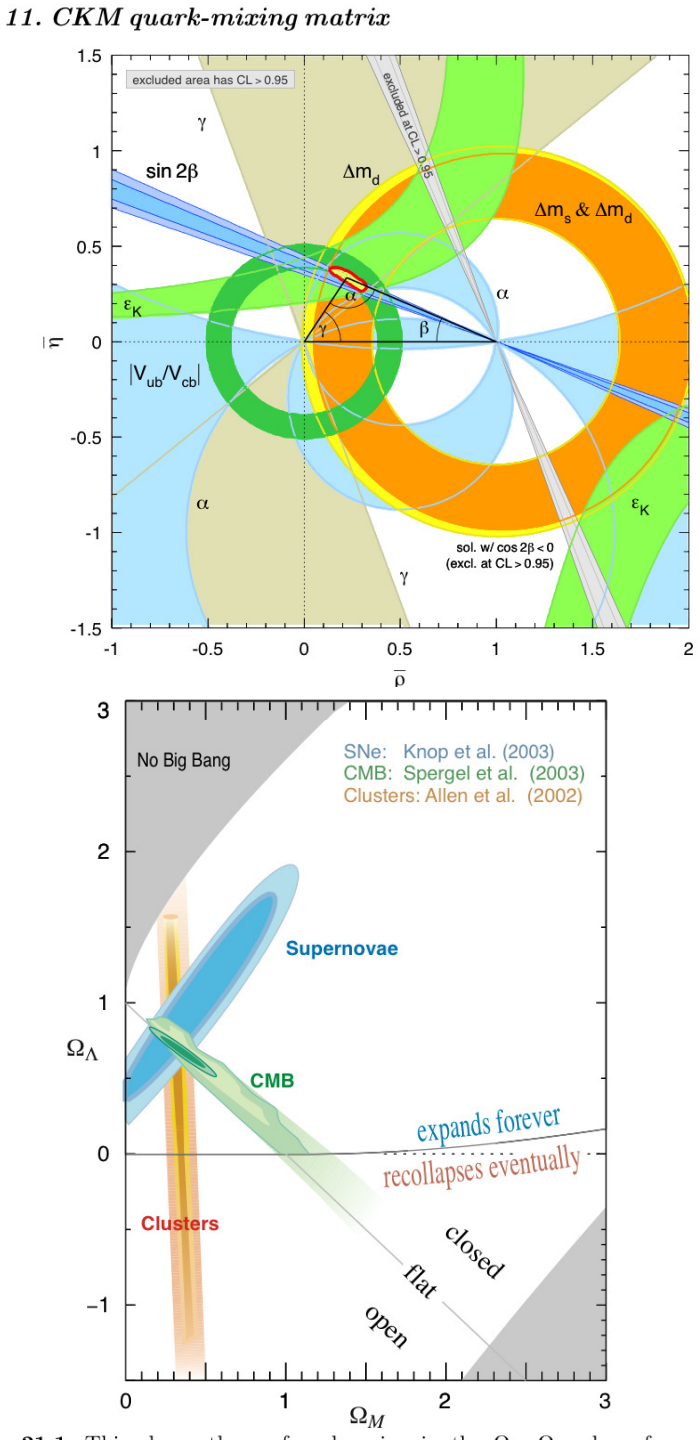
What we want…
a scientific legacy

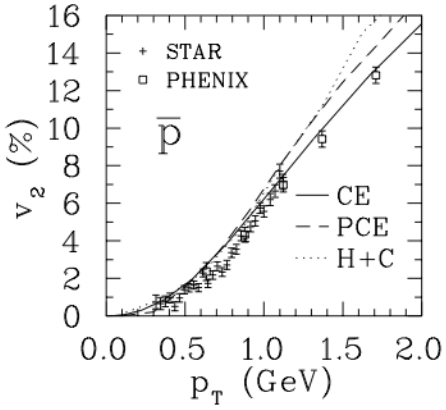
Concrete, reasonable goal, after ~USD10^9: Plot in PDG

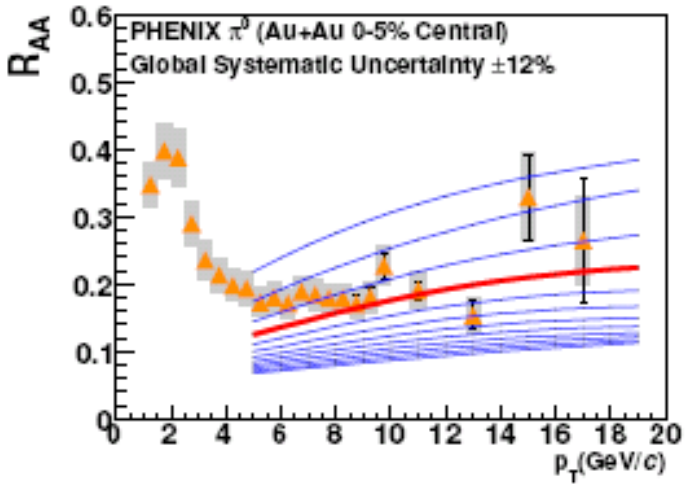
- Expressing fundamental, solid information on a theory or state of our Universe
- Experimentally-based
- "Solid theory" (can we do this?)
- With errorbars
  - ***Errorbars are as important as central values***

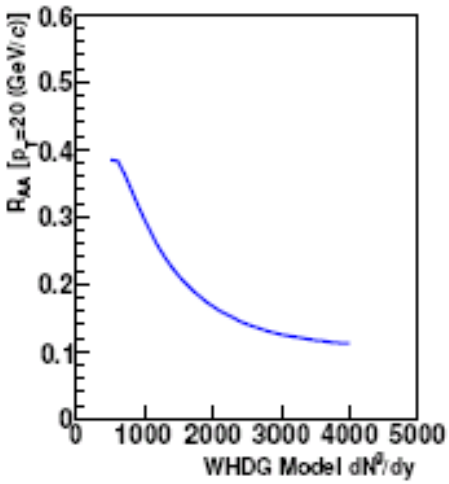
And it ***is*** urgent. Otherwise, we'll be singing "Glory Days" in 20 years

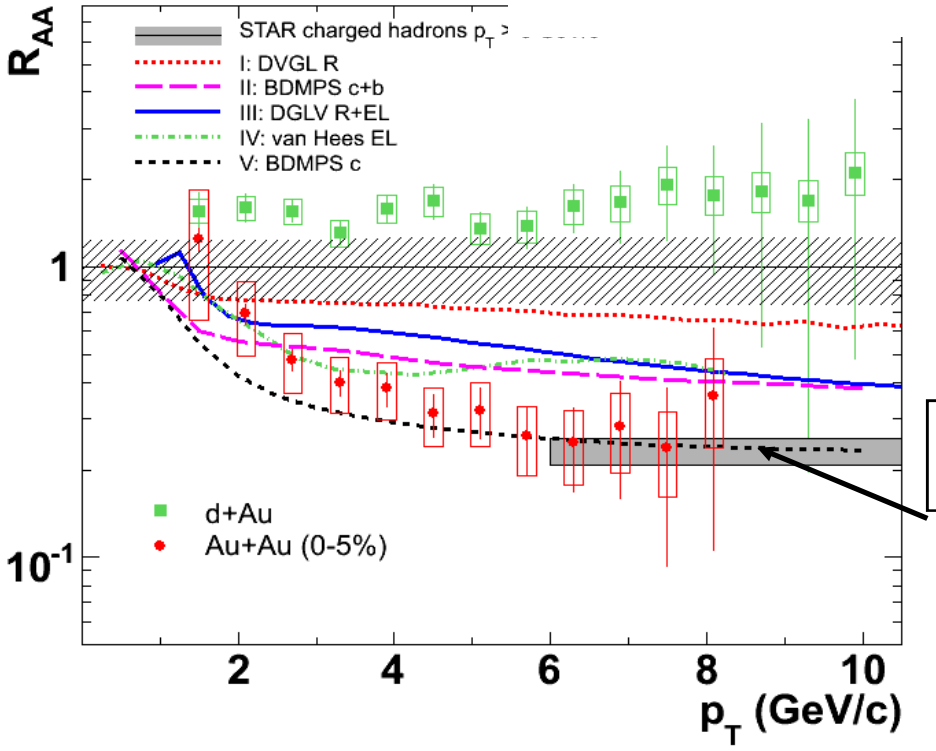


What we have









Standard radiative energy loss

ignore b-quark contribution

Further than we were!!

But this will not last beyond our lifetimes, nor should it.

Phase I : 3 Working Groups

N.B. ALL of these groups MUST have experiments & theorists

- Massive feedback necessary
- Experimentalists' experience with large-scale collaboration is key

WG I: what are the variables?

WG 2: standardization / interface definition (beyond OSCAR)

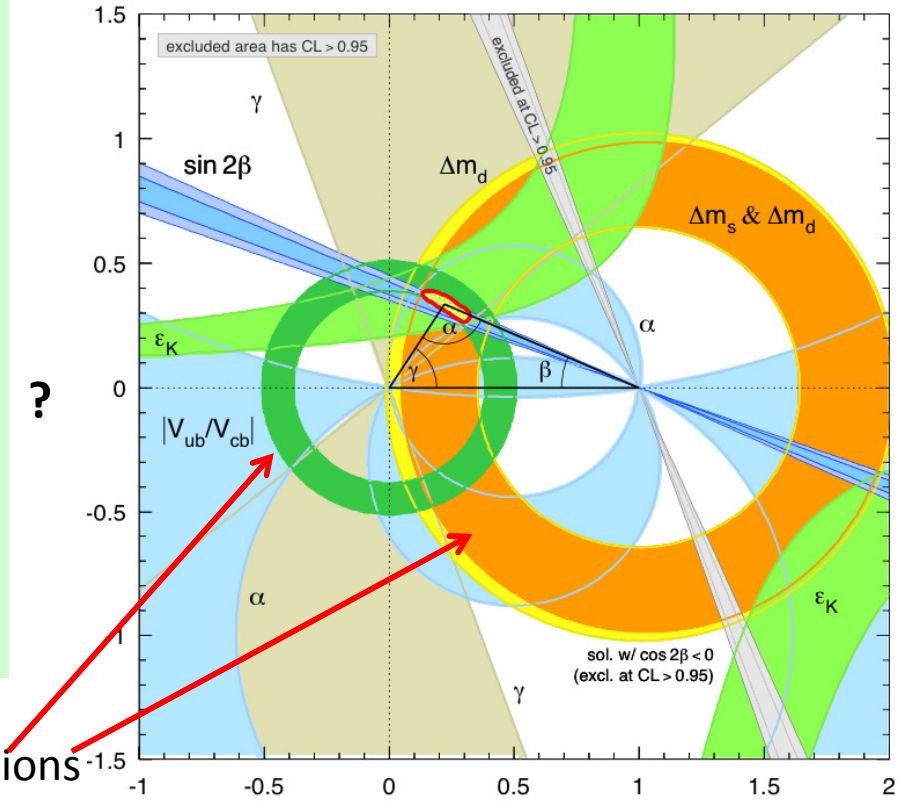
WG 3: statistical infrastructure: theory/exp, model/model, exp/exp

WG 4 (Scott's, but not mine): develop C++ viscous hydro

- Lots of hooks for folks to plug stuff in
- afterburner
- "standard model"

WG 1: what are the variables?

- "theory" (1)
  - (1a) fundamental: what goes on PDG plot
    - P(ε,μ)… η/s(T), T_{cr}, crit exponents
  - (1b) model: needed at least, for syst err
    - ε_0, τ_0, switching hydro->cascade
- observables
  - (2) v2, HBT, etc.
- Which "quantities" aren't quantities at all [e.g. Urs' talk]
  - hadronization mechanism
  - energy loss (ASW,GLV,AMY,HT)
    - not just qhat (but see Bass (Abjit's talk)



?

?

Constraints from experimental observations

"fundamental" quantity

Size of zones reflect uncertainties

- Experimental
- Model-related
  - From unplotted model parameters, T_{dec},ε_0 etc
  - ***"Approach" uncertainty:*** "same" physics input

WG 1, cont'd – estimate "block diagonalization"

experience / survey of existing results

helps focus/define effort

BUT off-diagonals are the point to an integrated approach

"hard/soft" is artificial and not helpful (in long run)

	ε_0	η	τ[therm]	P(ε)	T(ε)	γ, β, τ.	Q_S	σ	τ[string]	qhat
dN/dy										
"V_2"										
"HBT"										
soft spectra										
K/π fluct.										
Mass shifts										
γ's										
dileptons										
"R_{AA}"										

WG 1, cont'd – estimate "block diagonalization"

experience / survey of existing results

helps focus/define effort

BUT off-diagonals are the point to an integrated approach

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Mass shifts										
γ's										
dileptons										
"R_{AA}"										

"serial 1:1" (not even 1:many!!) considerable work

e.g talk of P. Huovinen:

ε versus shape versus η versus CE versus EoS versus …

Huge but crucial job (if we are serious): **many: many**

WG 1, cont'd – estimate "block diagonalization"

experience / survey of existing results

helps focus/define effort

BUT off-diagonals are the point to an integrated approach

"hard/soft" is artificial and not helpful (in long run)

	ε_0	η	τ[therm]	P(ε)	T(ε)	γ, β, τ.	Q_S	σ	τ[string]	qhat
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"HBT"										
soft spectra										
K/π fluct.										
Mass shifts										
γ's										
dileptons										
"R_{AA}"										

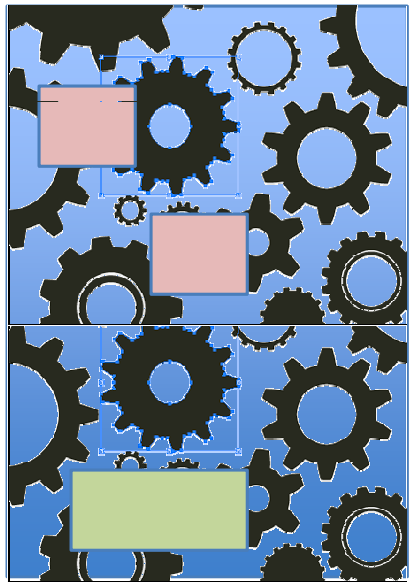
challenge now, even within an approach:

fixed conditions, reproducing "all" variables

WG2 – standardization/interfaces (OSCAR++)

concrete:
use ROOT framework

1. Maintenance of public repository of codes (OSCAR)
2. modular definition of initial conditions, EoS, freeze-out conditions, "sources" (jets in hydro), relaxation times
   - c.f. H. Song, Romatschke
3. common definition of output (hypersurfaces, etc), generation of observables
   - "OSCAR"



- Interaction with WG1 ("I/O" of variables)
- Interaction with WG3: verification

- Interaction with Scott's WG4:
  - connecting models (CGC+hydro+cascade+…)

WG3 – statistical infrastructure

extract “parameters” (physical and model) thu “fitting” dataset

~20 parameter “fit.”
• cannot be escaped

$$P(H \mid E) = \frac{P(E \mid H)P(H)}{P(E)}$$

c/o Scott Pratt

- P(H) is probability (in absence of E) for parameter set H
  a.k.a. the "prior distribution"
- P(E|H) is probability of E given H, i.e,

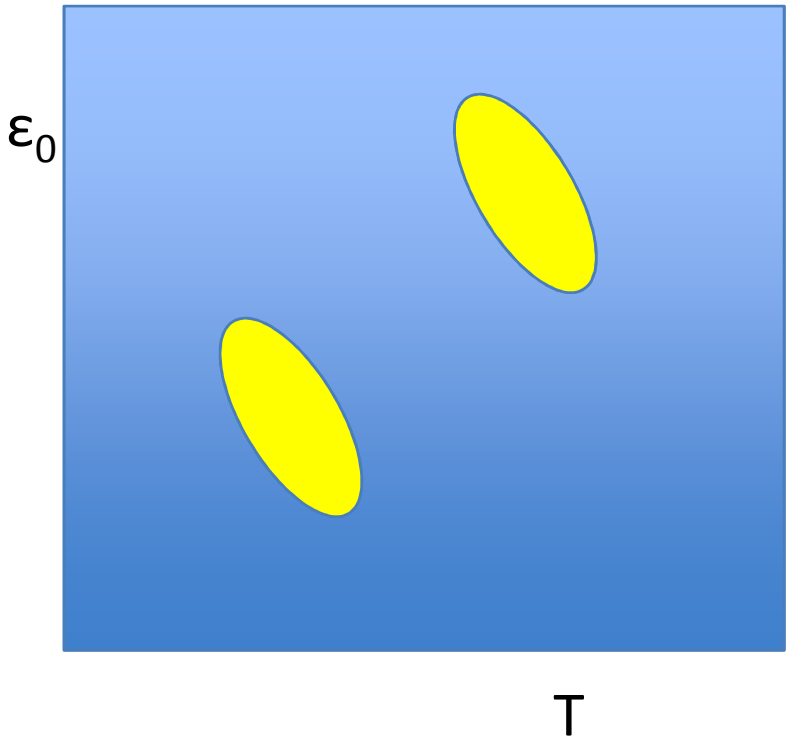
$$P \sim \exp\left(\sum \delta_i^2 / 2\sigma_i^2\right)$$

- P(E) is net probabiltiy of E, i.e., a normalization factor
- P(H|E) is probability of parameter set H given E

WG3 – statistical infrastructure

extract “parameters” (physical and model) thu “fitting” dataset

~20 parameter “fit.”
- cannot be escaped



	ε_0	η	T[chem]
dN/dy			
“V_2”			
“HBT”			
soft spectra			

Phase I : 3 Working Groups - **deliverables**

N.B. ALL of these groups MUST have experiments & theorists

- Massive feedback necessary
- Experimentalists' experience with large-scale collaboration is key

WG I: what are the variables?

report documentation – justifing

WG 2: standardization / interface definition (beyond OSCAR)

object structure

WG 3: statistical infrastructure

"test run" with 4x4 matrix, within one framework

Phase II – take exercise of WG3 to larger scale

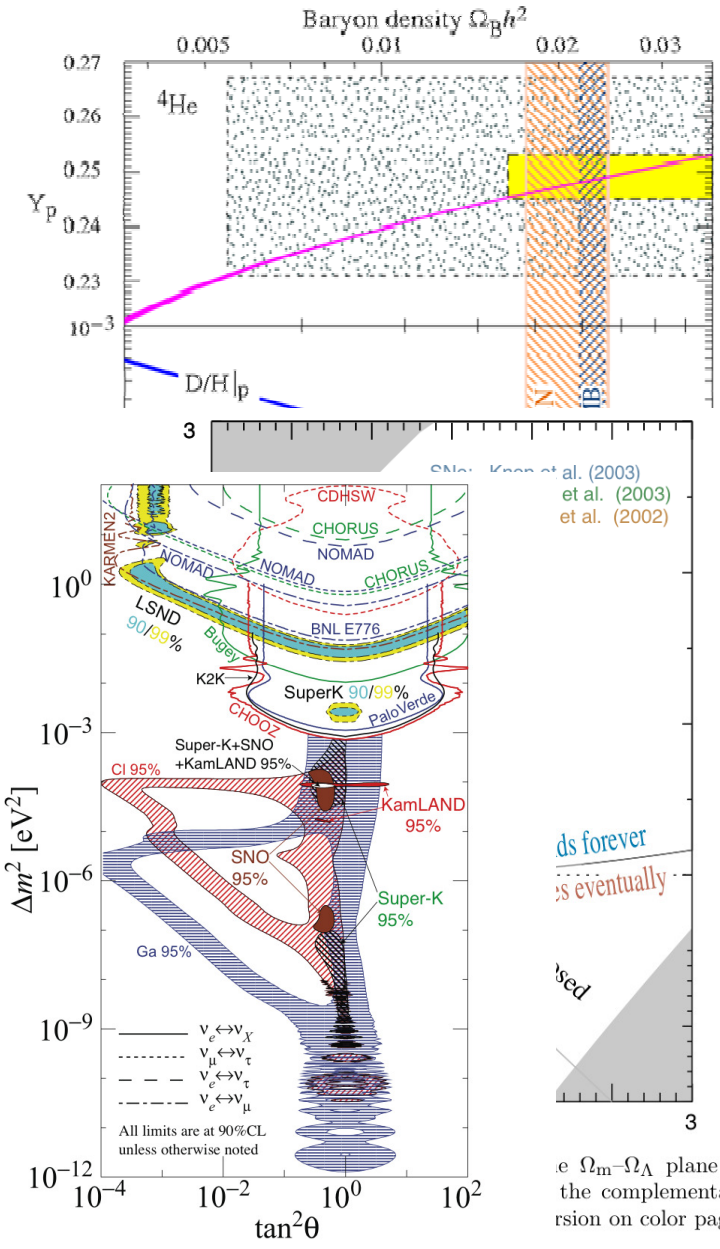


Figure 13.2: The regions of squared-mass splitting and mixing angle favored o excluded by various experiments. This figure was contributed by H. Murayama (University of California, Berkeley). References to the data used in the figure can b found at http://hitoshi.berkeley.edu/neutrino/ref2006.html. See full-color version on color pages at end of book.

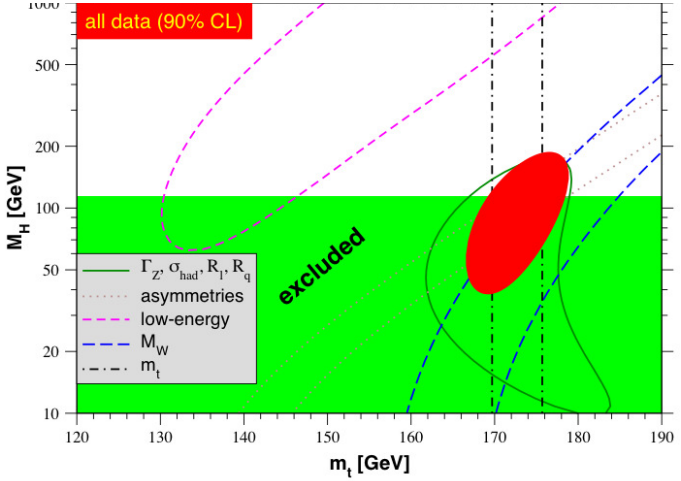


Figure 10.2: One-standard-deviation (39.35%) uncertainties in M_H as a function of m_t for various inputs, and the 90% CL region ($\Delta\chi^2 = 4.605$) allowed by all data. $\alpha_s(M_Z) = 0.120$ is assumed except for the fits including the Z-lineshape data. The 95% direct lower limit from LEP 2 is also shown. See full-color version on color pages at end of book.

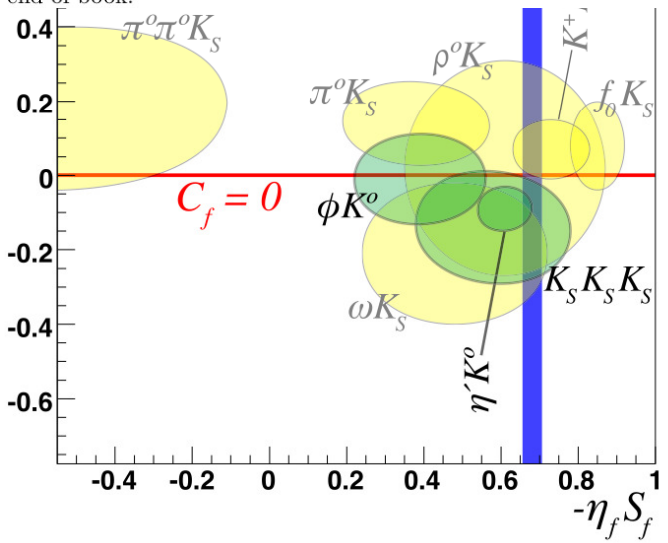


Figure 12.3: Summary of the results [20] of time-dependent analyses of $b \to q\bar{q}s$ decays, which are potentially sensitive to new physics. Subdominant corrections are expected to be smallest for the modes shown in green (darker). Results for final states including K^0 mesons combine CP-conjugate K_S and K_L measurements. The final state $K^+K^-K^0$ is not a CP eigenstate; the mixture of CP-even and CP-odd components is taken into account in obtaining an effective value for $\eta_f S_f$. Correlations between C_f and S_f are included when available. See full-color version on color pages at end of book.