

Status of ComPWA (Common Partial Wave Analysis)

Mathias Michel

Helmholtz Institute Mainz

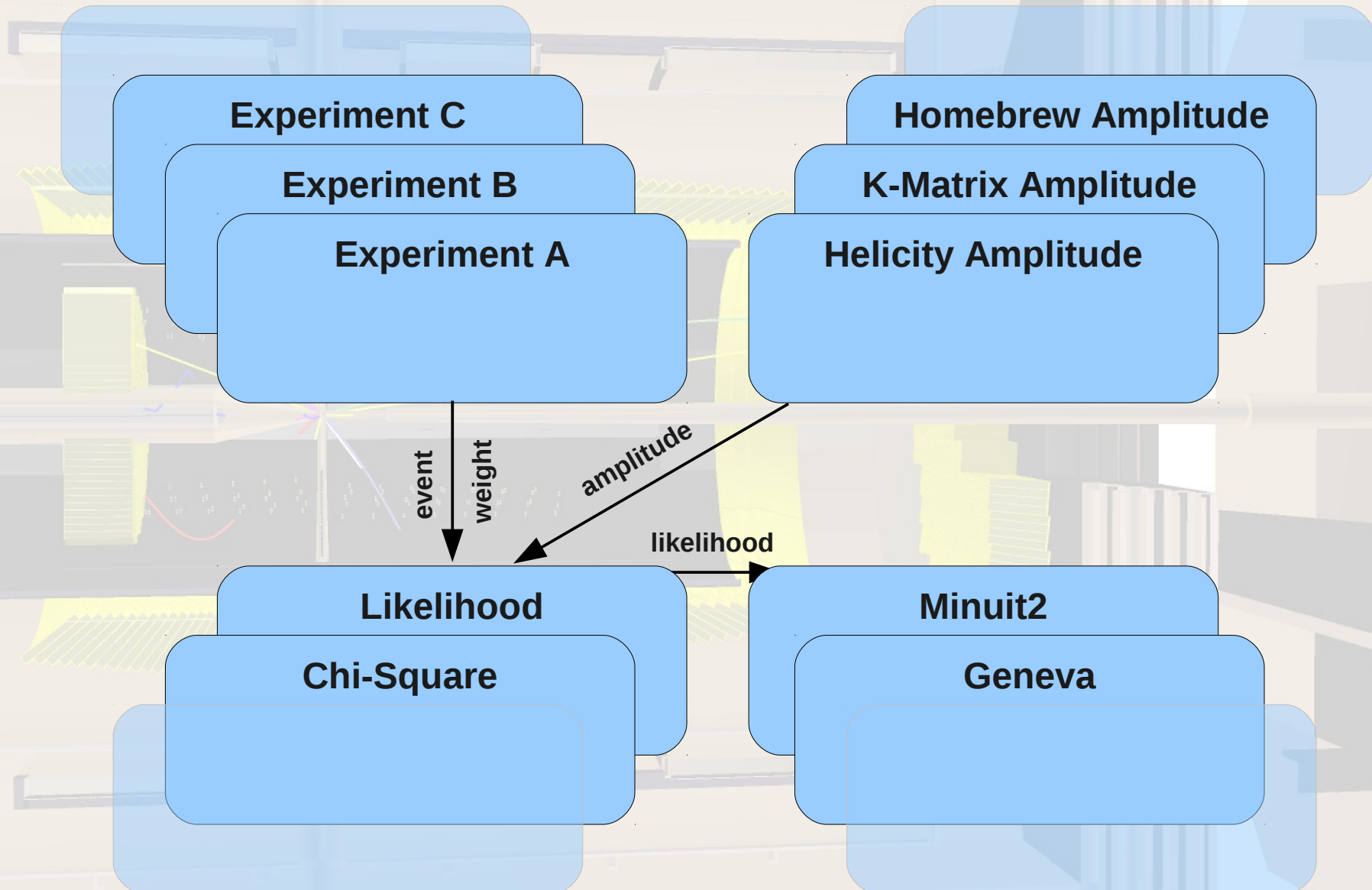
On behalf of the ComPWA group



Panda CM, GSI

December 10, 2013

ComPWA Framework



GitHub

PUBLIC  ComPWA / ComPWA

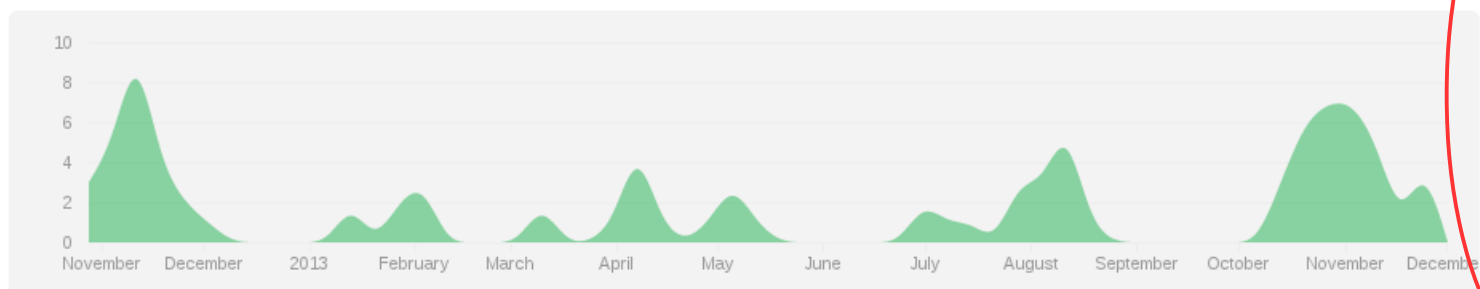
★ Star 1  Fork 0

Contributors Commits Code Frequency Punchcard

October 28th 2012 - December 1st 2013

Commits to master, excluding merge commits

Contribution Type: Commits



 MathiasMichel

#1

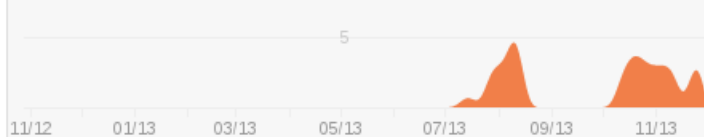
52 commits / 130,528 ++ / 10,671 --



 hansgans

#2

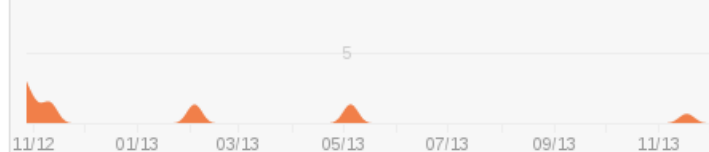
33 commits / 11,545 ++ / 9,607 --



 ffeldbauer

#3

11 commits / 3,386 ++ / 32,624 --

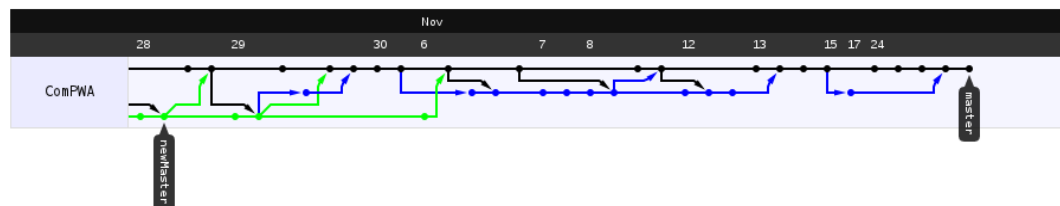


The ComPWA network graph

All branches in the network using ComPWA/ComPWA as the reference point. [Read our blog post about how it works.](#)

Keyboard shortcuts available 

Show Help



Tools & Navigation

GitHub

- github.com → search “ComPWA” → first result

- **Public Links:**

Repository: <https://github.com/ComPWA/ComPWA/>

Wiki pages: <https://github.com/ComPWA/ComPWA/wiki>

Documentation: <http://compwa.github.io/ComPWA/>

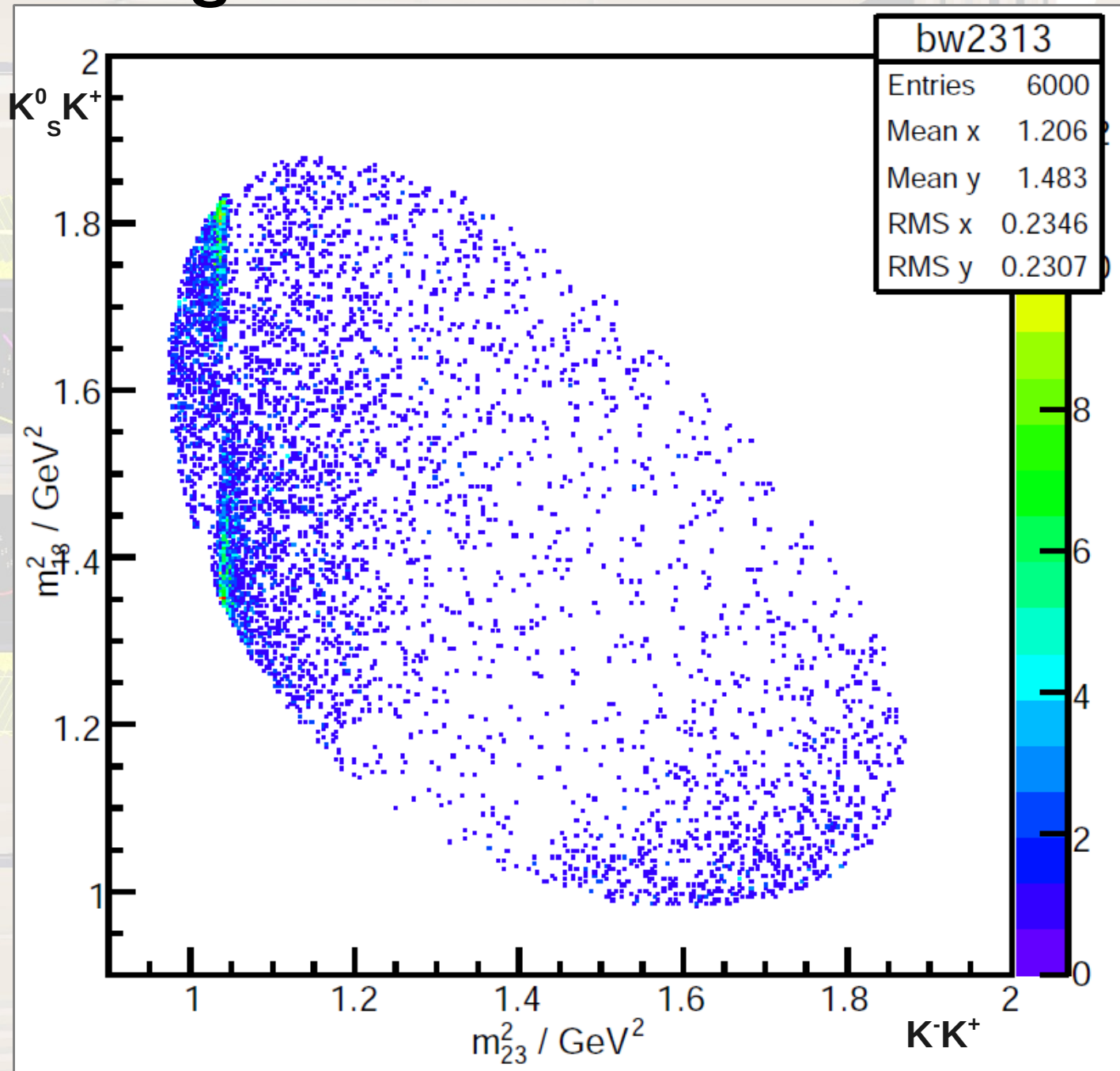
- **Copyright: GPL**

New Tests by Peter Weidenkaff

$$D_0 \rightarrow K_S^0 K^- K^+$$

- Comparison of BaBar Analysis results with ComPWA
- Model: extended relativistic Breit-Wigner-Sum-Model
- Resonances simulated:
 - $a_{00} \rightarrow K^+ K^-$
 - $a_0^+ \rightarrow K_S^0 K^+$
 - $\phi \rightarrow K^+ K^-$
 - $f_0(1400) \rightarrow K^+ K^-$

$D_0 \rightarrow K_s^0 K^- K^+$ ComPWA-Dalitz

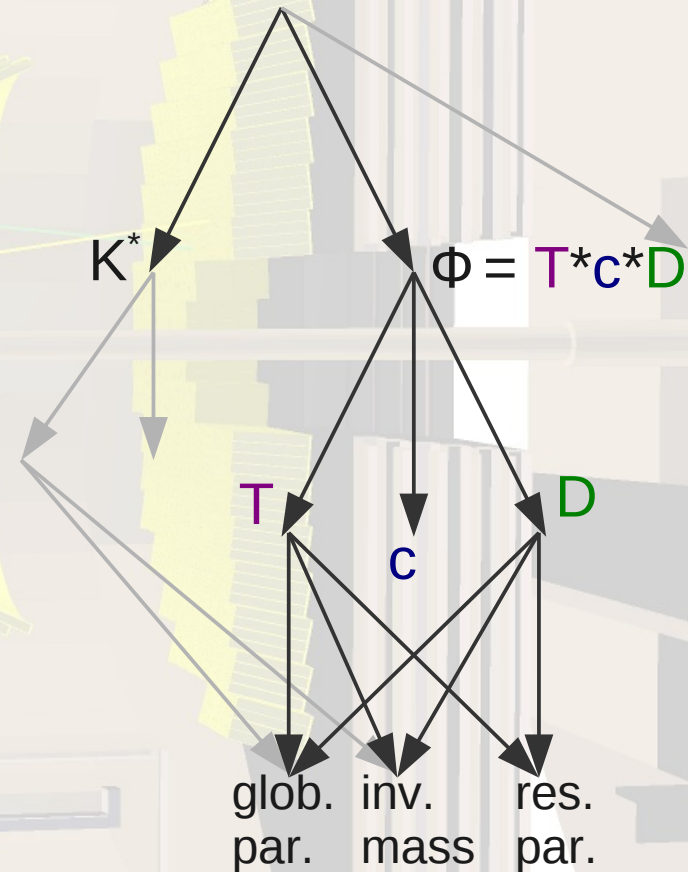


FunctionTree

$$I = \left| \sum_n T_n r_n e^{i\varphi_n} D_n \right|^2$$

T = Breit-Wigner Function
D = D-Wigner Function
r = Strength of Resonance
 φ = Phase of Resonance

$$A = \sum (T^* c^* D)$$



FunctionTree: Strategies

Node

List of parents
List of children
My parameter
Strategy

Strategy pattern

execute function

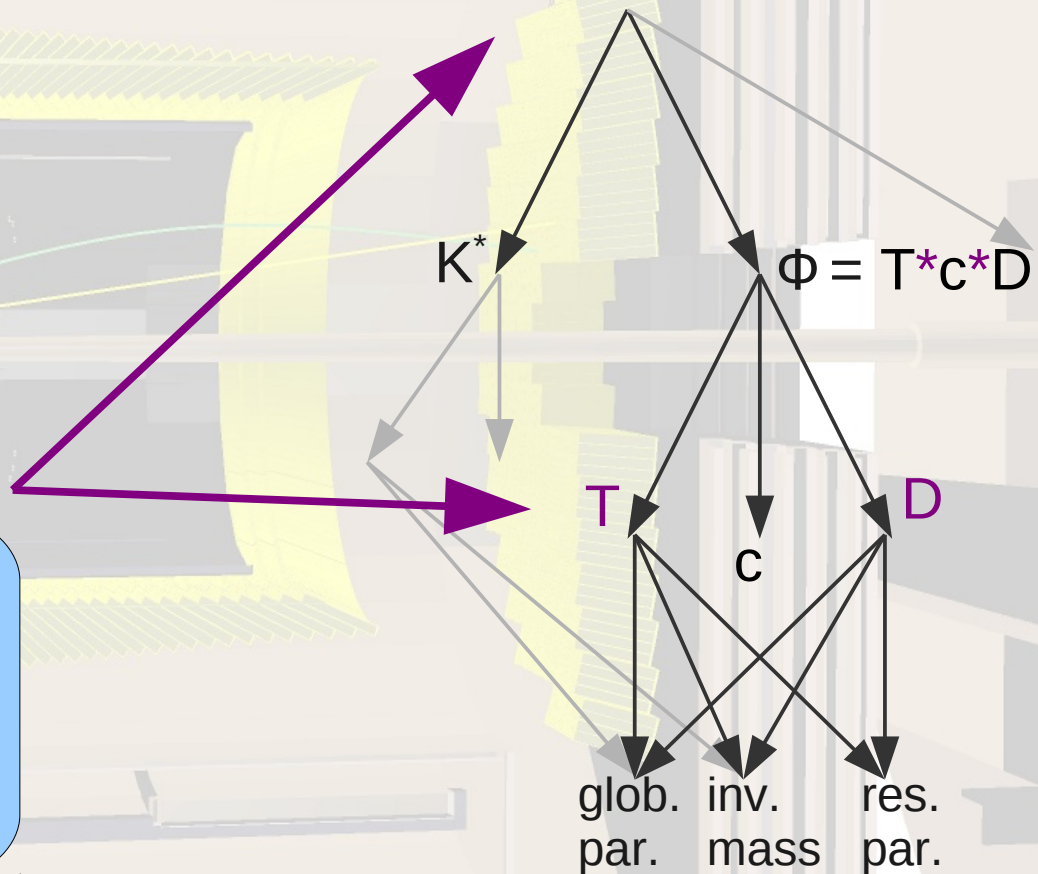
input:

parameter list (children)

output:

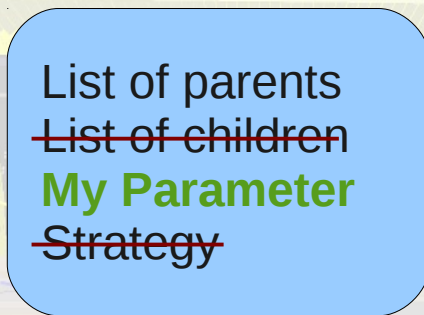
calculated parameter

$$A = \sum (T * c * D)$$

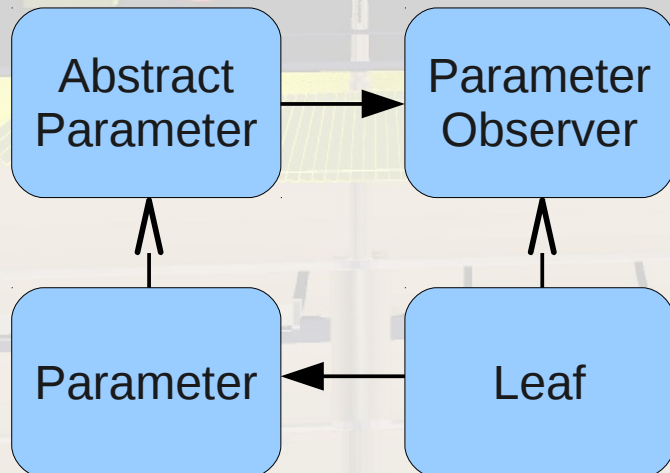


FunctionTree: Parameters

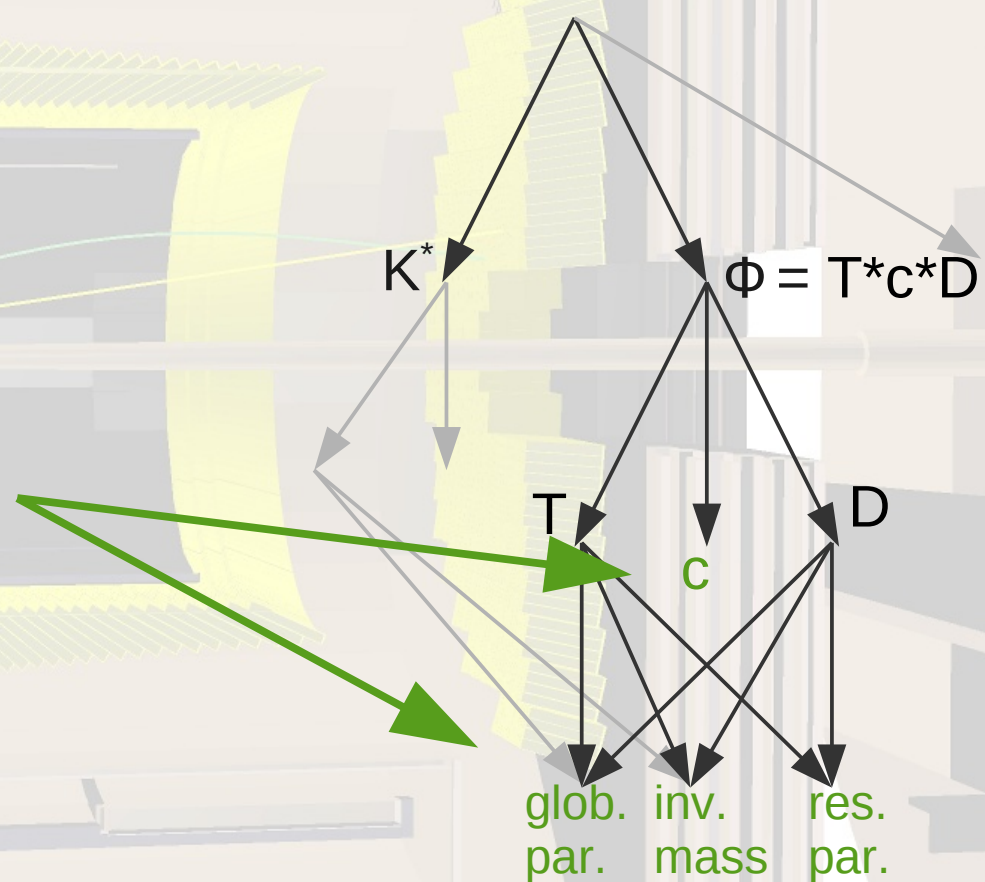
Leaf



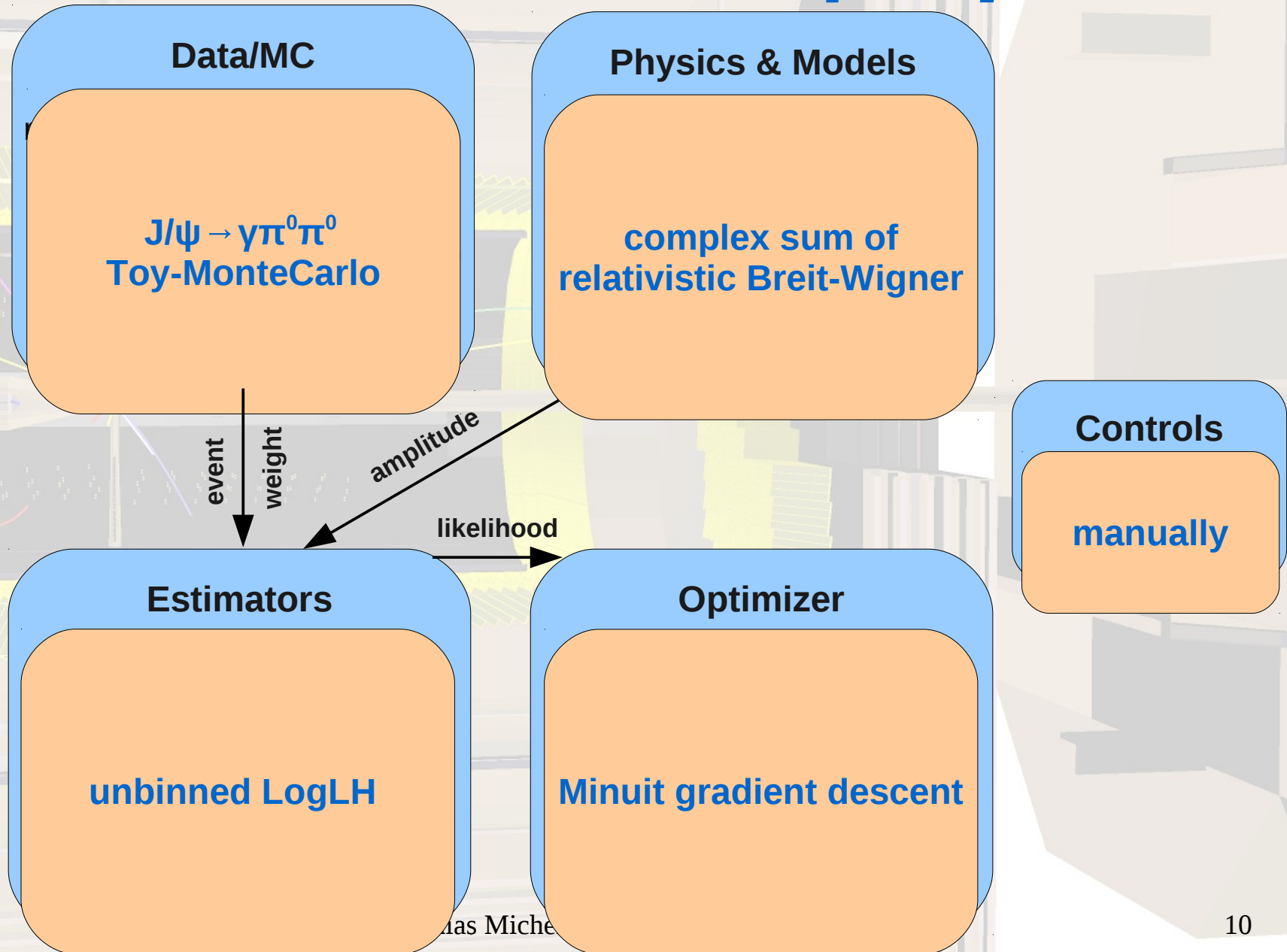
Observer pattern



$$A = \sum (T^*c^*D)$$



Test Environment: $J/\psi \rightarrow \gamma\pi^0\pi^0$



$J/\psi \rightarrow \gamma \pi^0 \pi^0$ Model



$$I = \left| \sum_n T_n r_n e^{i\varphi_n} D_n \right|^2$$

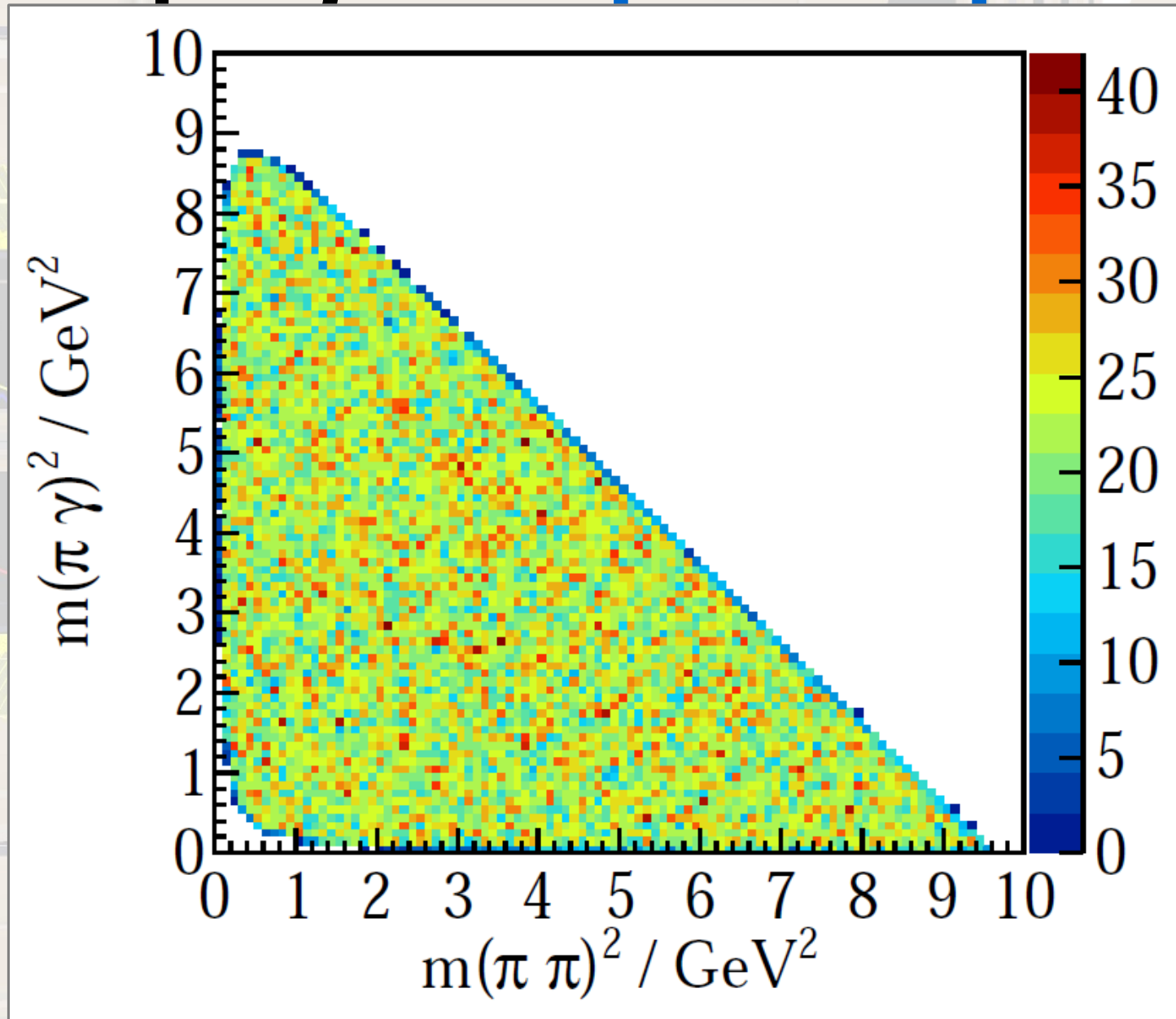
T = Breit-Wigner Function

D = D-Wigner Function

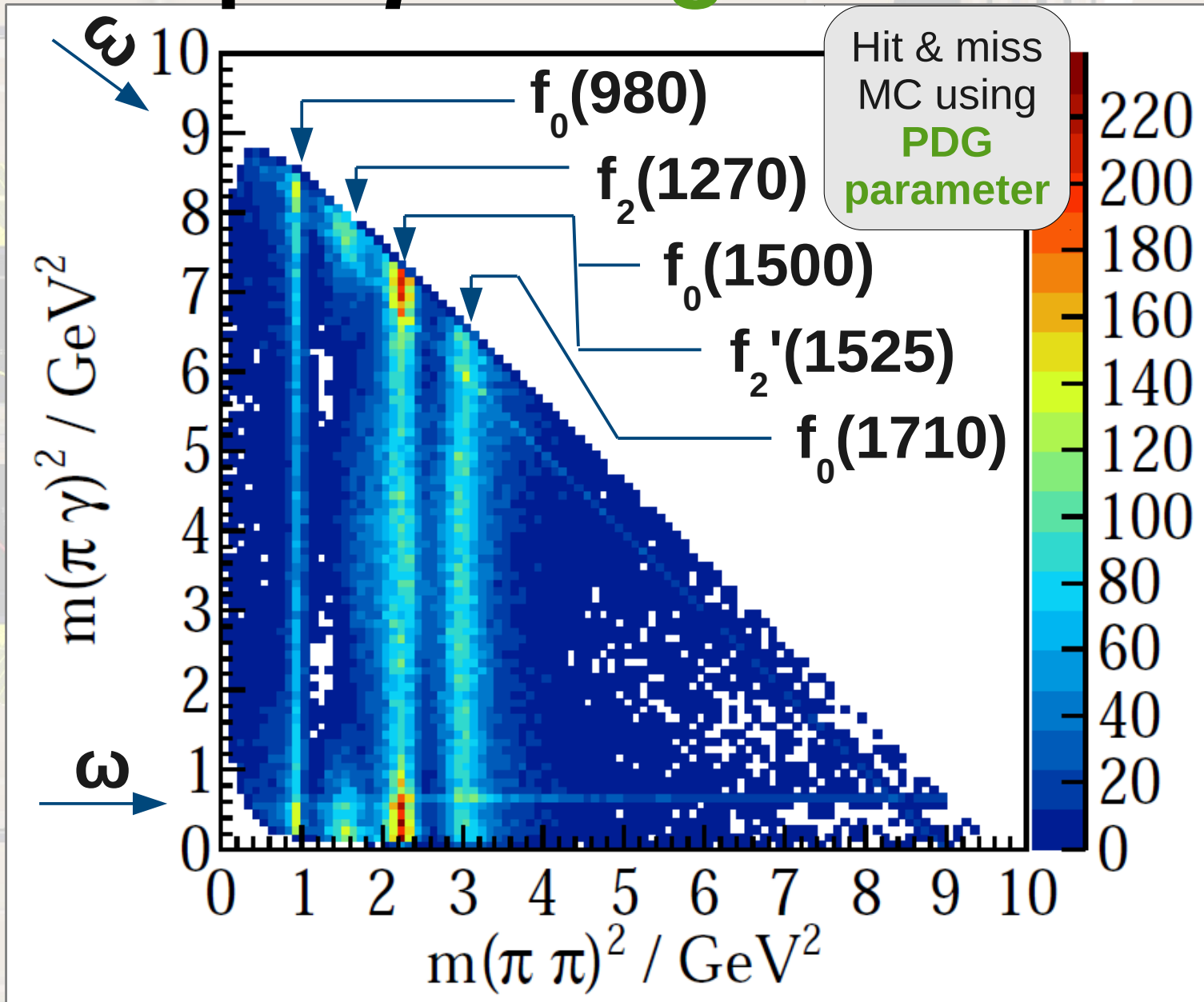
r = Strength of Resonance

φ = Phase of Resonance

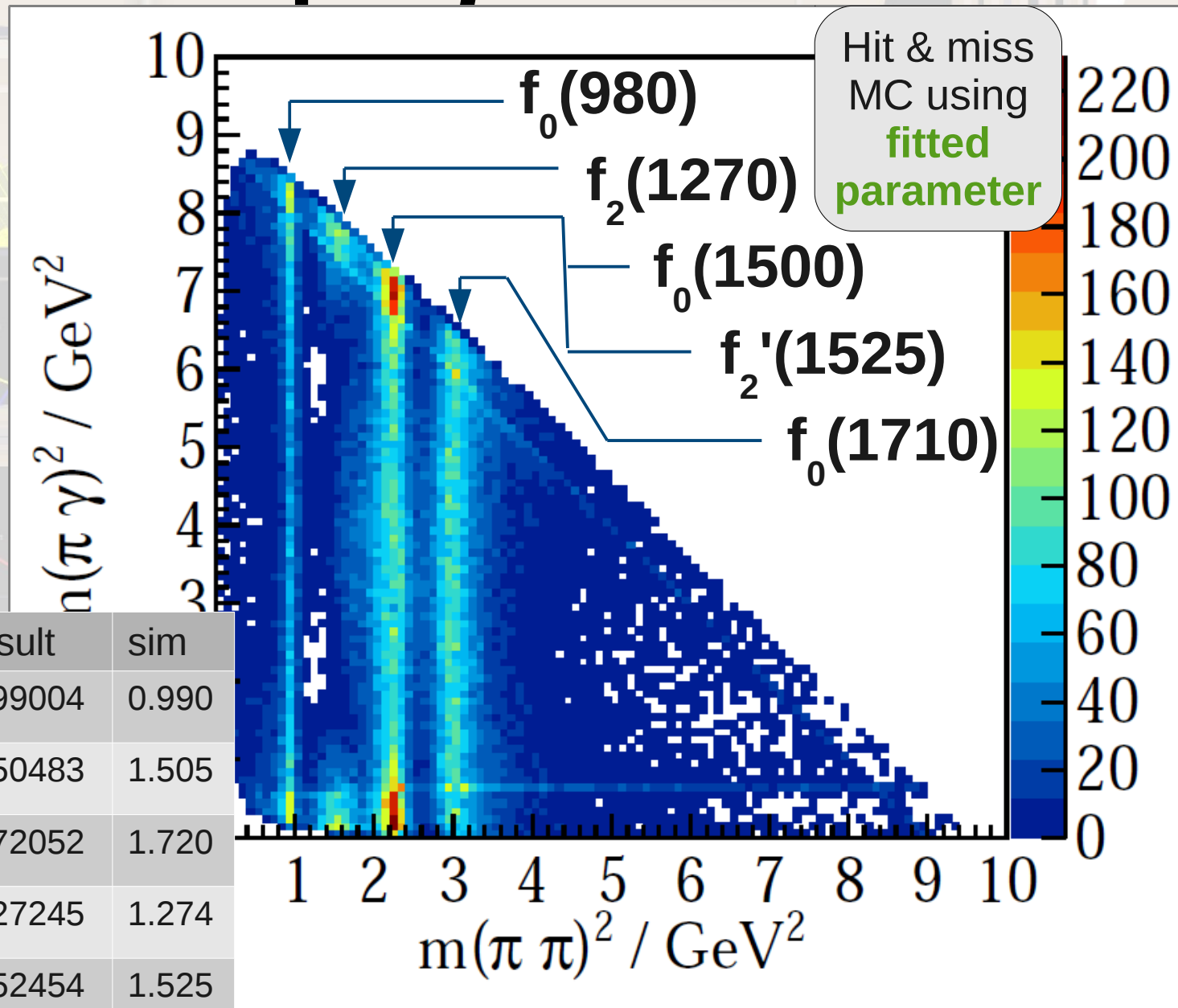
$J/\psi \rightarrow \gamma \pi^0 \pi^0$ phasespace



$J/\psi \rightarrow \gamma \pi^0 \pi^0$ generated



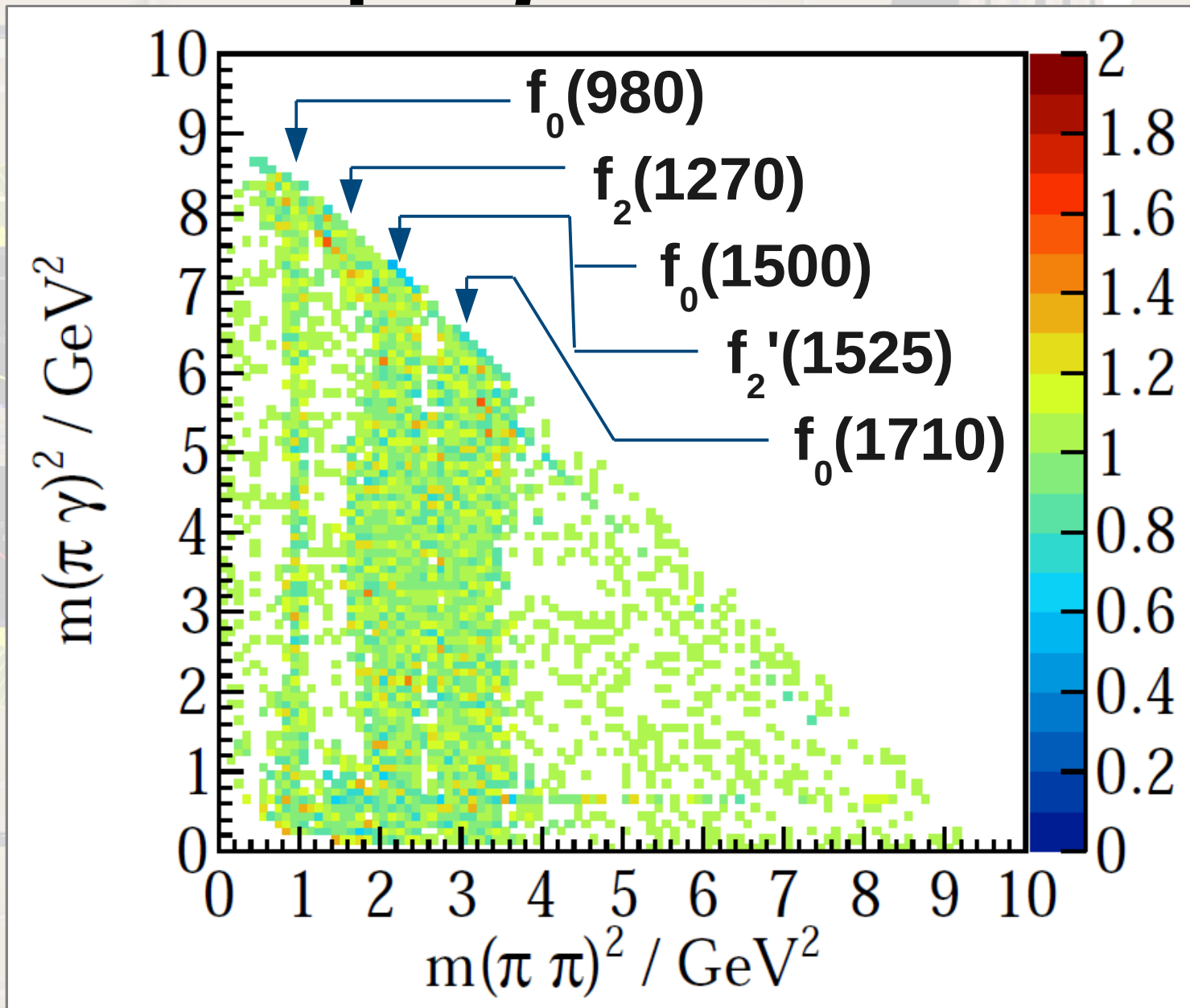
$J/\psi \rightarrow \gamma \pi^0 \pi^0$ first fit



mass of	result	sim
$f_0(980)$	0.99004	0.990
$f_0(1500)$	1.50483	1.505
$f_0(1710)$	1.72052	1.720
$f_2(1270)$	1.27245	1.274
$f_2'(1525)$	1.52454	1.525

Start values. 0.95 optimal

$J/\psi \rightarrow \gamma \pi^0 \pi^0$ ratio



Status & Outlook

Language and Dependencies

C++11
Boost
Boost.Build

Optional External Packages Used

Root
qft++
Minuit2
Geneva

Documentation

Doxygen
Doku Wiki

Version-Control

Git

Work in progress!

New Stuff:

XML Particle Table
Sum Model extended
Function Tree

Biggest ToDo's

controls and configuration
documentation module
more physics cases

Contact

michel@kph.uni-mainz.de
[Github.com/ComPWA/ComPWA](https://github.com/ComPWA/ComPWA)