# Fitting results of resonance parameters

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2015-05-27

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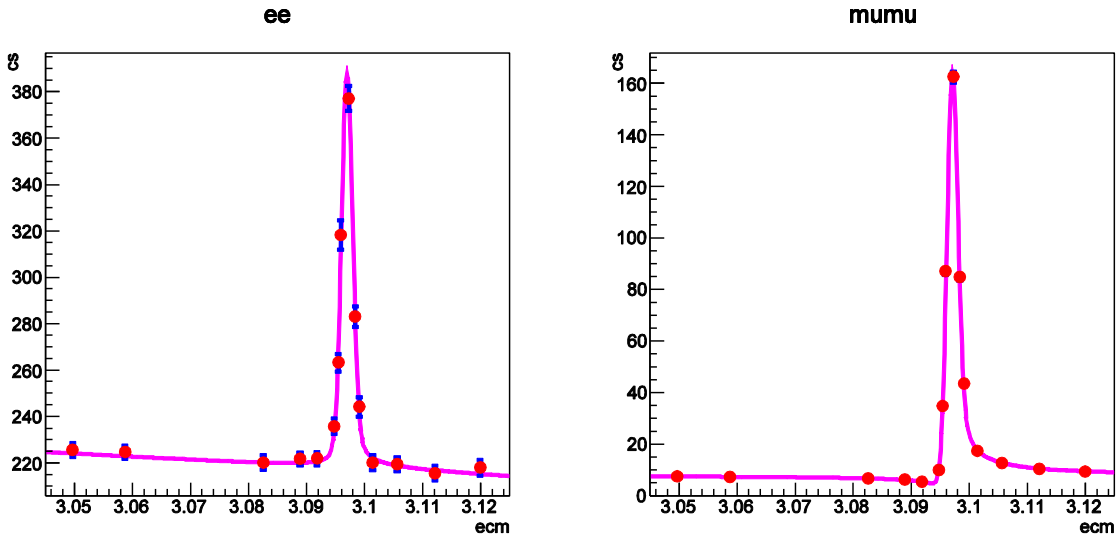
Requested energies , raw BEMS energies and revised BEMS energies

| requested energies | raw BEMS energies | revised BEMS energies |
|---|---|---|
| 3.0500 | 3.050206 | 3.049658 |
| 3.0600 | 3.059257 | 3.058709 |
| 3.0830 | 3.083060 | 3.082512 |
| 3.0900 | 3.089418 | 3.088870 |
| 3.0930 | 3.092324 | 3.091776 |
| 3.0943 | 3.095261 | 3.094713 |
| 3.0952 | 3.095994 | 3.095446 |
| 3.0958 | 3.096390 | 3.095842 |
| 3.0969 | 3.097777 | 3.097229 |
| 3.0982 | 3.098904 | 3.098356 |
| 3.0990 | 3.099606 | 3.099058 |
| 3.1015 | 3.101923 | 3.101375 |
| 3.1055 | 3.106144 | 3.105596 |
| 3.1120 | 3.112615 | 3.112067 |
| 3.1200 | 3.120442 | 3.119894 |

The revised BEMS energies equal corresponding raw BEMS energies subtracting 0.548Mev , which is the difference between M value from the simultaneous fitting result of two lepton channels and that form PDG

# Simultaneous fitting result of e+e- →e+e- and e+e- →mu+mu- Direct result




```
**************************************
Minimizer is Minuit / Migrad
Chi2                      =     16.1205
NDf                       =          25
Edm                       =   1.6235e-08
NCalls                    =         142
M                         =     3.09692   +/-   2.859e-05        (limited)
Tw                        =     9.29e-05                  (fixed)
EwMEwDTw                  =   3.5935e-07   +/-   1.23291e-08     (limited)
EwMMwDTw                  =  3.31998e-07   +/-   6.01119e-09     (limited)
Ew                        =     5.55e-06                  (fixed)
SrOEwMMw                  =  5.64303e-06   +/-   1.52086e-07     (limited)
Es                        =  0.000908722   +/-   1.78192e-05     (limited)
```

# Parameter transformation results

The combined parameters

| Name | Value | Error | Relative Error (%) |
|---|---|---|---|
| EwMEwDTw | 3.5935e-07 | 1.23291e-08 | 3.43 |
| EwMMwDTw | 3.31998e-07 | 6.01119e-09 | 1.81 |
| SrOEwMMw | 5.64303e-06 | 1.52086e-07 | 6.33 |

The raw parameters from error propagation method

| Name | Value | Error | Relative Error (%) |
|---|---|---|---|
| Tw | 9.59156e-05 | 5.45395e-06 | 5.69 |
| Ew | 5.87088e-06 | 1.94946e-07 | 3.32 |
| Mw | 5.42402e-06 | 3.4339e-07 | 6.33 |

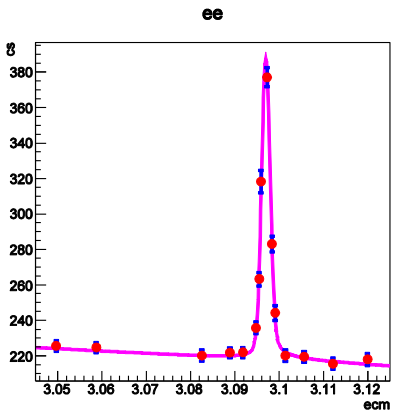
The raw parameters from mente carlo method

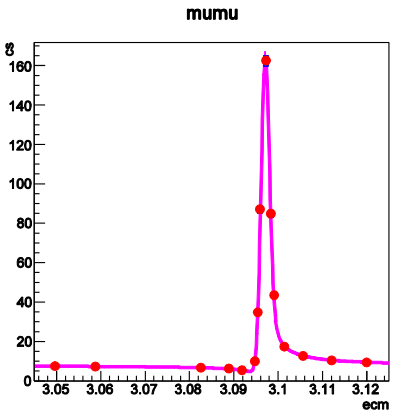
| Name | Value | Error | Relative Error (%) |
|---|---|---|---|
| Tw | 9.60158e-05 | 5.45526e-06 | 5.68 |
| Ew | 5.87068e-06 | 1.94884e-07 | 3.32 |
| Mw | 5.42645e-06 | 1.80188e-07 | 3.32 |

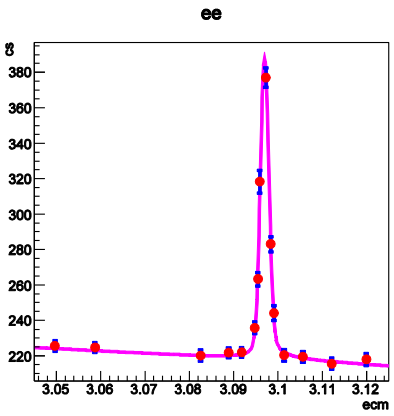
# About the mente carlo method for parameter transformation

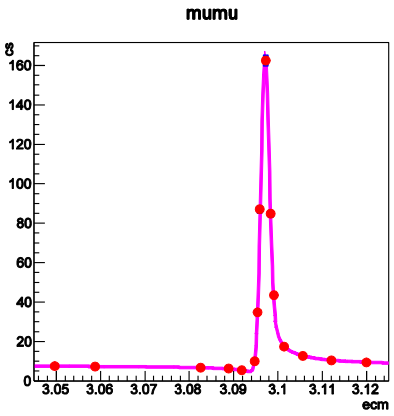
- As for Muon width， error propagation method gives too large error , about two times of that of Electron Width
- I think it may be caused by the limitations of error propagation method
- So I want  to use monte carlo method , i.e. sampling method
- In the sampling method , I presume that the combined parameters obeys normal distribution , with the value from fitting as its mean , and error as its standard deviation
- This hypothesis is where I have no confidence
- I do 1 million sampling and got the current result

# recheck



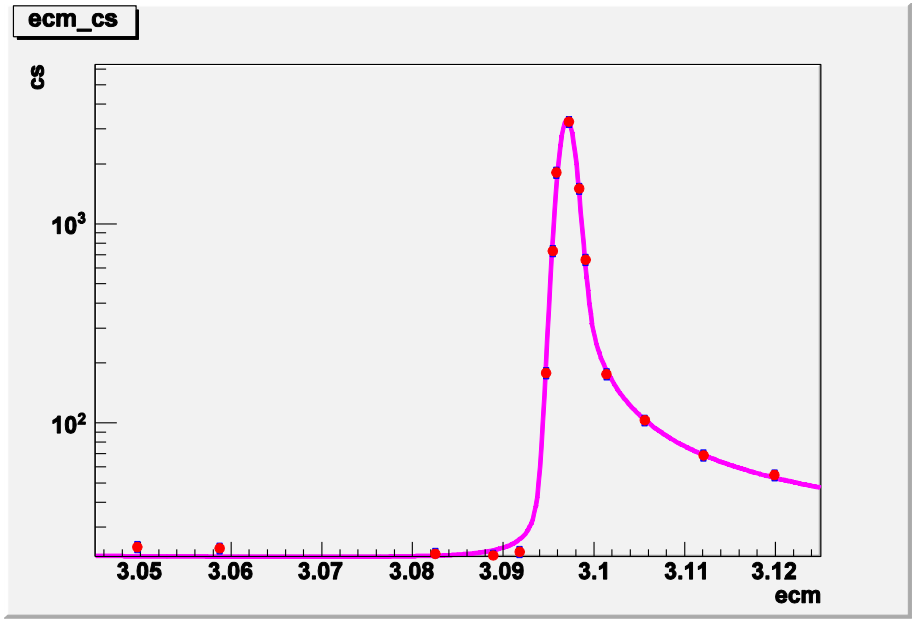




```
****************************************
Minimizer is Minuit / Migrad
Chi2                      =      16.1205
NDf                       =           25
Edm                       =   1.6235e-08
NCalls                    =          142
M                         =      3.09692   +/-   2.859e-05       (limited)
Tw                        =     9.29e-05                   (fixed)
EwMEwDTw                  =   3.5935e-07   +/-   1.23291e-08     (limited)
EwMMwDTw                  =  3.31998e-07   +/-   6.01119e-09     (limited)
Ew                        =     5.55e-06                   (fixed)
SrOEwMMw                  =  5.64303e-06   +/-   1.52086e-07     (limited)
Es                        =  0.000908722   +/-   1.78192e-05     (limited)
```

```
****************************************
Minimizer is Minuit / Migrad
Chi2                      =      16.2649
NDf                       =           25
Edm                       =  1.40662e-08
NCalls                    =          153
M                         =      3.09692   +/-   2.85534e-05     (limited)
Tw                        =  9.60158e-05                   (fixed)
EwMEwDTw                  =  3.59537e-07   +/-   1.23558e-08     (limited)
EwMMwDTw                  =  3.31812e-07   +/-   5.99051e-09     (limited)
Ew                        =  5.87068e-06                   (fixed)
SrOEwMMw                  =   5.6583e-06   +/-   1.52051e-07     (limited)
Es                        =  0.000907343   +/-   1.77804e-05     (limited)
```

Simple fitting result of hadron channel

Direct result




FCN=25.471 FROM MINOS STATUS=SUCCESSFUL 58 CALLS 321 TOTAL

EDM=2.38326e-10 STRATEGY= 1 ERROR MATRIX ACCURATE

| EXT PARAMETER | | | PARABOLIC | MINOS ERRORS | |
|---|---|---|---|---|---|
| NO. | NAME | VALUE | ERROR | NEGATIVE | POSITIVE |
| 1 | M | 3.09693e+00 | 4.15031e-05 | -4.14641e-05 | 4.15260e-05 |
| 2 | Tw | 9.60158e-05 | fixed | | |
| 3 | EwMHw | 5.16290e-10 | 1.27314e-11 | -1.27357e-11 | 1.28404e-11 |
| 4 | Es | 9.03060e-04 | 3.37609e-05 | -3.43872e-05 | 3.46157e-05 |
| 5 | R | 2.28956e+00 | 5.47926e-02 | -5.52594e-02 | 5.52465e-02 |

# Necessary explanation

- ConExc generator is used when getting the experimental cross sections for fitting
- No interference term is included in the theory formula
- The R value in the jpsi region are presumed to be one constant and set free when fitting
- The total width is fixed in the value from simultaneous fitting of e+e-→e+e- and e+e-→mu+mu- and monte carlo parameter transformation method

# Result discussion

- The combined parameter EwMHw can be evaluated from the results of lepton channels i.e.

  EwMHw=Ew(Tw - Ew-Mw)

  =5.87068e-06*(9.60158e-05-5.87068e-06-5.42645e-06) =4.97356e-10

  which is consistency with the fitting result of this channel .

- The free parameter R is about 2.29 , consistency with Gaozhen's preliminary result .

- Even in Mr Hu's generator , the interference effect are not considered .

- Can I also ignore the interference effect in the theory formula for fitting ?

| Ecm | Rvalue |
|---|---|
| 3.0500 | 2.308 |
| 3.0600 | 2.363 |
| 3.0800 | 2.425 |
| 3.4000 | 2.283 |

R value from Gaozhen's report

# Backup
# The KEDR results

$$\Gamma_{ee} \times \Gamma_{ee} / \Gamma = 0.3323 \pm 0.0064 \pm 0.0048 (keV)$$
$$\Gamma_{ee} \times \Gamma_{\mu\mu} / \Gamma = 0.3318 \pm 0.0052 \pm 0.0063 (keV)$$
$$\Gamma_{ee} \times \Gamma_{ee} / \Gamma = 0.3323 \pm 0.0080 (keV)$$
$$\Gamma_{ee} \times \Gamma_{\mu\mu} / \Gamma = 0.3318 \pm 0.0082 (keV)$$
$$\Gamma_{11} = 5.59 \pm 0.12 (keV)$$
$$\Gamma = 94.1 \pm 2.7 (keV)$$

$$\Gamma_{ee} \times \Gamma_{ee} / \Gamma = 0.3323 \pm 1.9\% \pm 1.4\% (keV)$$
$$\Gamma_{ee} \times \Gamma_{\mu\mu} / \Gamma = 0.3318 \pm 1.6\% \pm 1.9\% (keV)$$
$$\Gamma_{ee} \times \Gamma_{ee} / \Gamma = 0.3323 \pm 2.4\% (keV)$$
$$\Gamma_{ee} \times \Gamma_{\mu\mu} / \Gamma = 0.3318 \pm 2.5\% (keV)$$
$$\Gamma_{11} = 5.59 \pm 2.1\% (keV)$$
$$\Gamma = 94.1 \pm 2.9\% (keV)$$

# CLEO Results

Tw=96.1+-3.8KeV