Muon g-2 reconstruction + SUSY: status report

- Try to produce SUSY samples at ILC500 with Whizard2.8.5
  - Theorists prepared “blr1.slha” and SINDARLIN files but beam energy spread was not included
  - Worked to include ISR / beam energy spread by implementing CIRCE2
  - Included PYTHIA6 and TAUOLA as well
  - Calculated cross-section (Xsec) for each SUSY process, and generate some events
- Working directory on KEKCC
  - /home/ilc/skawada/SUSYg-2/blr1

	BLR1	BLR2	BLR3	BLR4
M_1	100	100	150	150
$m_{\mathrm{L}} = m_{\mathrm{R}}$	150	150	200	200
$\tan\beta$	5	10	5	10
μ	1323	678	1922	973
$m_{\widetilde{\mu}_1}$	154	154	202	202
$m_{\widetilde{\mu}_2}$	159	159	207	208
$m_{\widetilde{\tau}_1}$	113	113	159	158
$m_{\widetilde{\tau}_2}$	190	191	242	243
$m_{\widetilde{\nu}_{\mu,\tau}}$	137	136	190	190
$m_{\widetilde{\chi}_1^0}$	99	99	150	149
$m_{\widetilde{\chi}_2^0}, m_{\widetilde{\chi}_3^0}, m_{\widetilde{\chi}_1^\pm}$	1323–1324	678–680	1922–1923	973–975
$a_\mu^{\mathrm{SUSY}} \times 10^{10}$	27	27	17	17
$\Omega_{\mathrm{DM}}h^2$	0.120	0.120	0.120	0.120
$\sigma_p^{\mathrm{SI}} \times 10^{47}$ [cm^2]	1.7	3.7	0.8	1.9
$\mu_{\gamma\gamma}$	1.01	1.01	1.01	1.01

Units in GeV

So far, I am only working with BLR1 parametrization.

Xsec

Process $e^+e^- \rightarrow$	Pol (e-, e+)	Xsec (fb)	N = L*Xsec (Assume L = 4 ab^{-1})	N = L*Xsec (Assume L = 1.6 ab^{-1})
$\widetilde{\mu_L}^+\widetilde{\mu_L}^-$	-80/+30	99.1388 +- 0.0079	396555	158622
$\widetilde{\mu_L}^+\widetilde{\mu_L}^-$	+80/-30	25.9426 +- 0.0021	103770	41508
$\widetilde{\mu_R}^+\widetilde{\mu_R}^-$	-80/+30	26.9622 +- 0.0021	107849	43140
$\widetilde{\mu_R}^+\widetilde{\mu_R}^-$	+80/-30	92.4999 +- 0.0072	370000	148000
$\widetilde{\tau_1}^+\widetilde{\tau_1}^-$	-80/+30	92.9890 +- 0.0063	371956	148782
$\widetilde{\tau_1}^+\widetilde{\tau_1}^-$	+80/-30	86.6444 +- 0.0059	346578	138631
$\widetilde{\tau_2}^+\widetilde{\tau_2}^-$	-80/+30	29.0410 +- 0.0033	116164	46466
$\widetilde{\tau_2}^+\widetilde{\tau_2}^-$	+80/-30	26.3214 +- 0.0029	105286	42114
$\widetilde{\tau_1}^+\widetilde{\tau_2}^-$	-80/+30	8.18989 +- 0.00062	32760	13104
$\widetilde{\tau_1}^+\widetilde{\tau_2}^-$	+80/-30	6.48573 +- 0.00050	25943	10377
$\widetilde{\tau_2}^+\widetilde{\tau_1}^-$	-80/+30	8.19128 +- 0.00062	32765	13106
$\widetilde{\tau_2}^+\widetilde{\tau_1}^-$	+80/-30	6.48553 +- 0.00050	25942	10377

1.6 ab^{-1} is the integrated luminosity of ILC500 with -80/+30 and +80/-30

Problems / Questions / Next Step (1)

- When I include Pythia, it crushed.
  - Up to Xsec calculation works, but not for event generation.
- I set Tauola is on, but it keeps PDG +-15 (no decay of tau) in the event.

- **Solved?:** These are solved when I put the sentence "$ps_PYTHIA_PYGIVE = "MDCY(C1000022,1)=0"" in sindarlin file explicitly (written in Whizard manual).

Problems / Questions / Next Step (2)

- When running TAUOLA, I got the following message.
  - Subroutine fill_pyjets_spin_data: tau helicity information is not set, though polarized tau decay was requested. Most likely, the SINDARIN file does not include polarized for particles and/or not ?polarized_events=true
  - Still no tau decay exist in tau events. Maybe due to this message?

- **Solved?:** Put the sentence “?polarized_events=true” in global.

Problems / Questions / Next Step (3)

- Found ~4[7]% events have stable tau (no daughters of tau) in stau1+stau2-[stau1+stau1-] event.
- The biggest difference with Keita's study is with or without SUSY contribution.