Status of the $K_S \rightarrow 3\pi^0$ analysis

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Introduction

- **Data samples:**
  - **Datarec v38:** runs 88965 - 89096 (in total 63.42 pb^{-1})
  - **Datarec v37**: runs: 88965 - 89096 (in total 63.42 pb^{-1})

- Preselection with the following requirements:

  - K_L-crash: E>150 MeV, $0.2 < \beta < 0.225$
  - prompt photons:

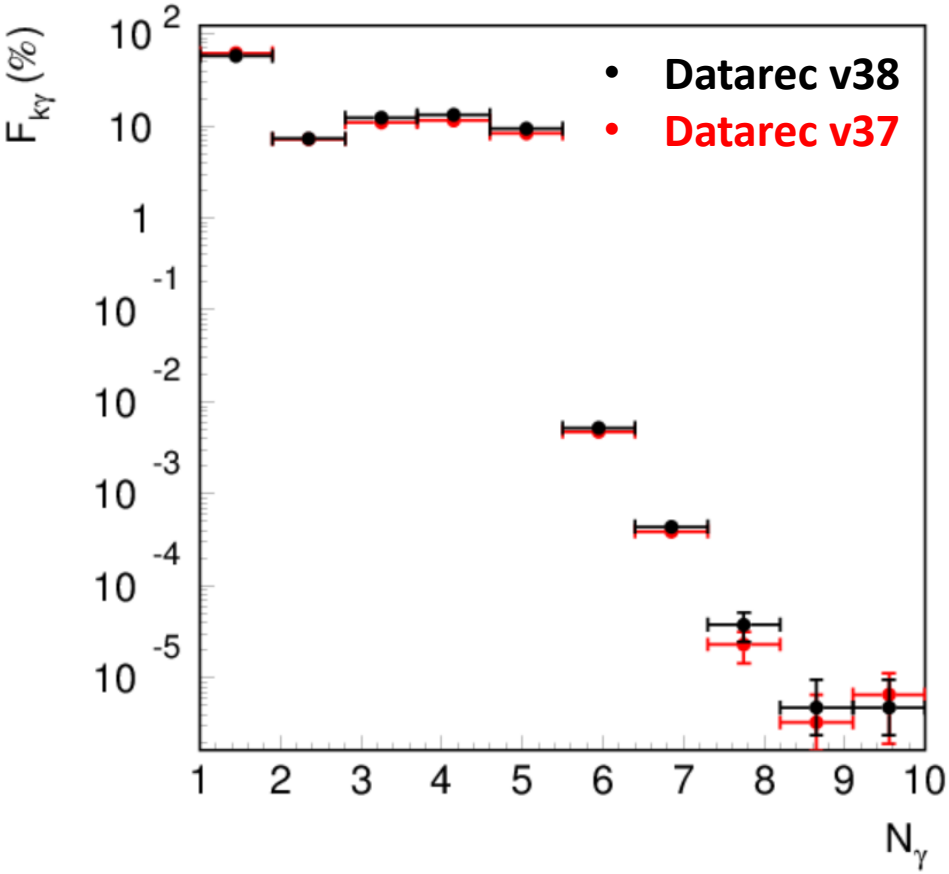
    $E_{cl} > 20$ MeV,

    $|\cos\theta_{cl}| \leq 0.915$,

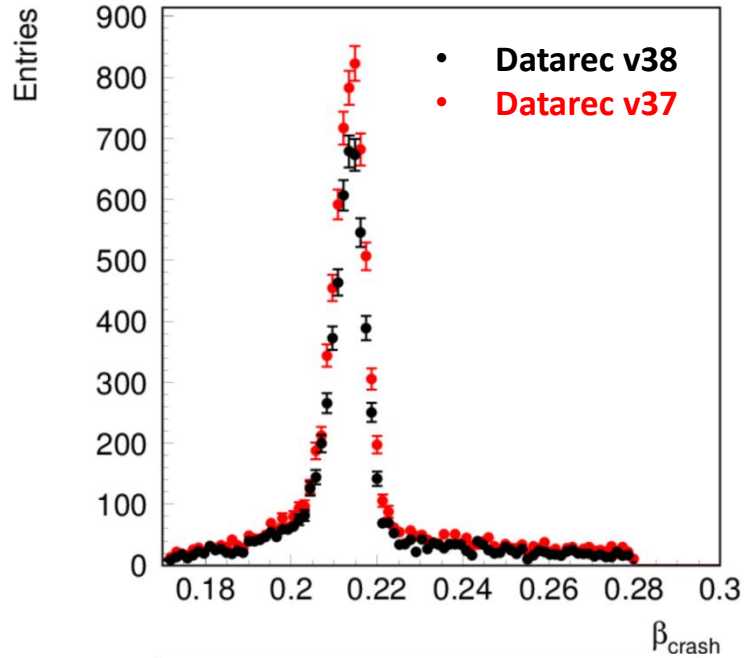
    $|\Delta T_{cl}| \leq \mathrm{Min}(3.0 \cdot \sigma_T(E_{cl}), 2\ \mathrm{ns})$

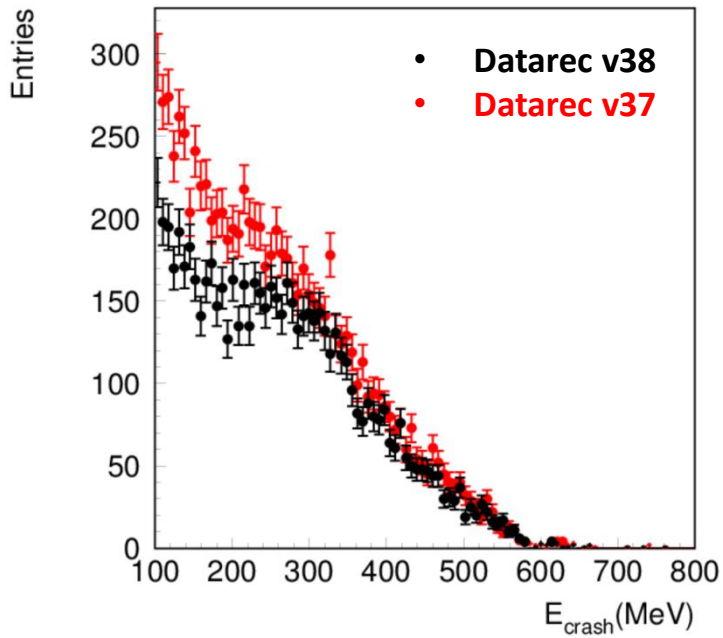
- $K_S \rightarrow 2\pi^0$ (4 prompt photons) used for normalization for the $K_S \rightarrow 3\pi^0$ measurement

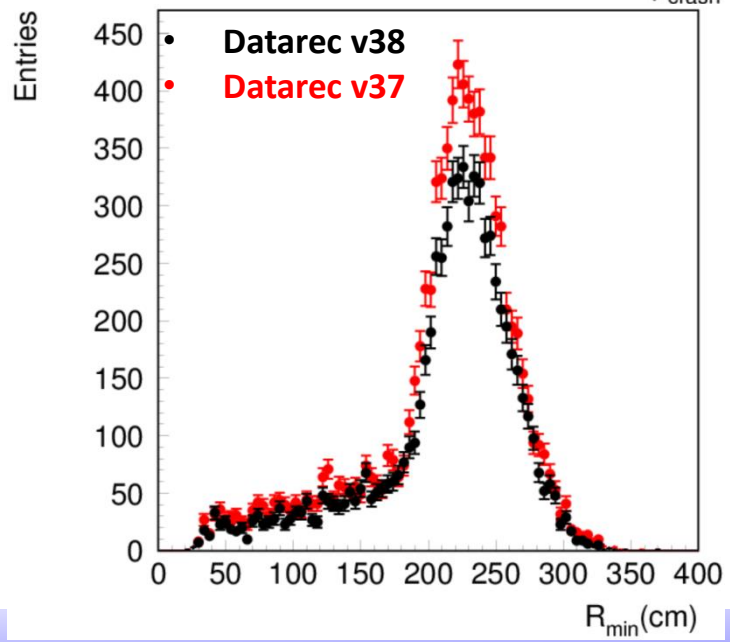
- For each sample we apply cosmic veto and check ECLtag & FILFO words.

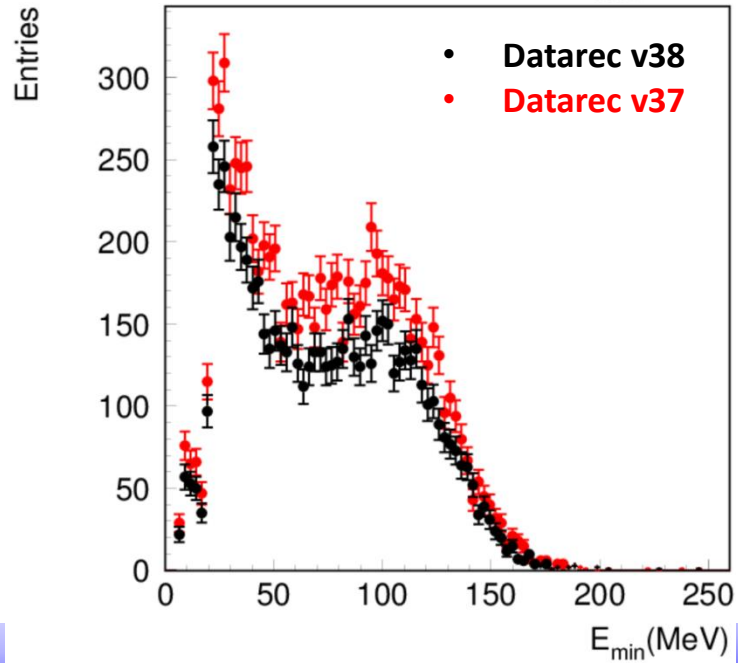


4γ sample

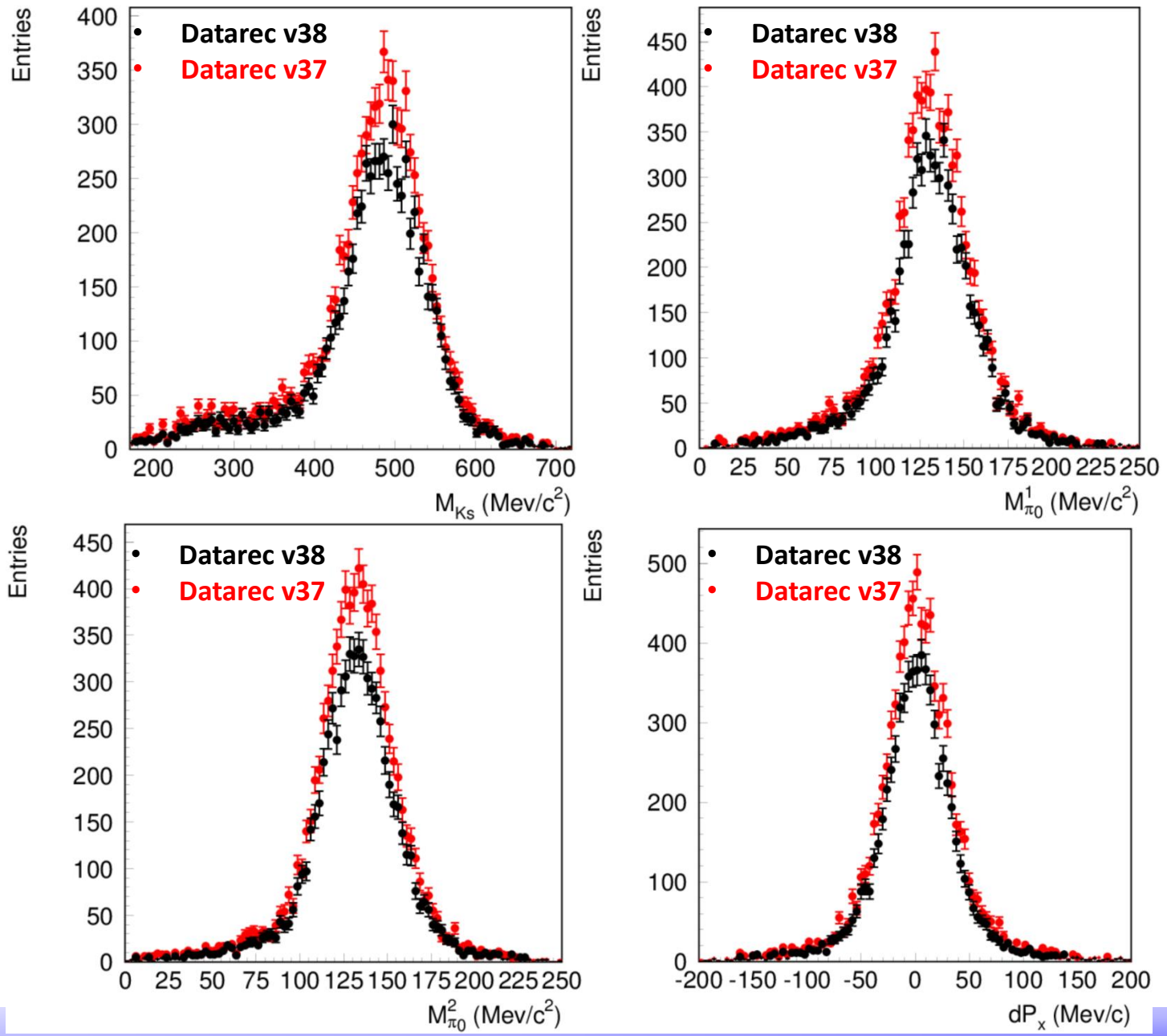

Entries
Datarec v38
Datarec v37
β_{crash}


Entries
Datarec v38
Datarec v37
E_{crash}(MeV)

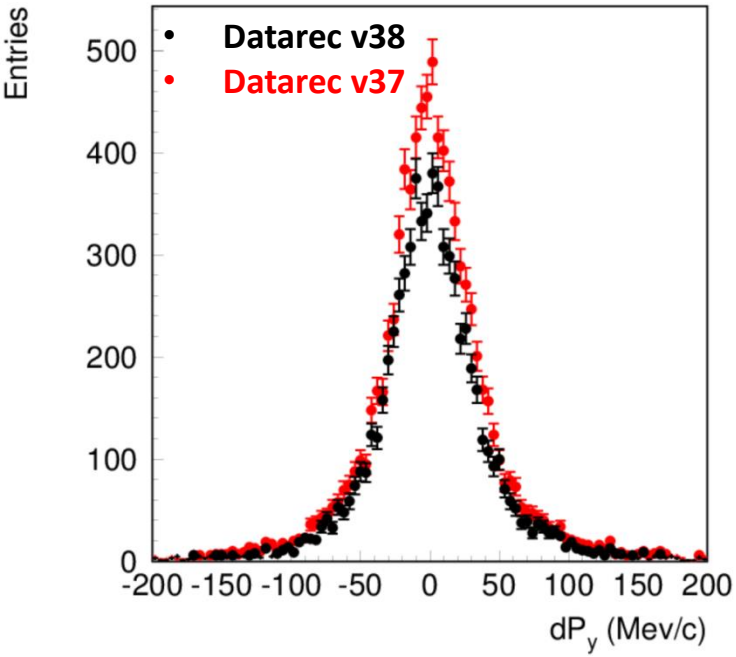

Entries
Datarec v38
Datarec v37
R_{min}(cm)

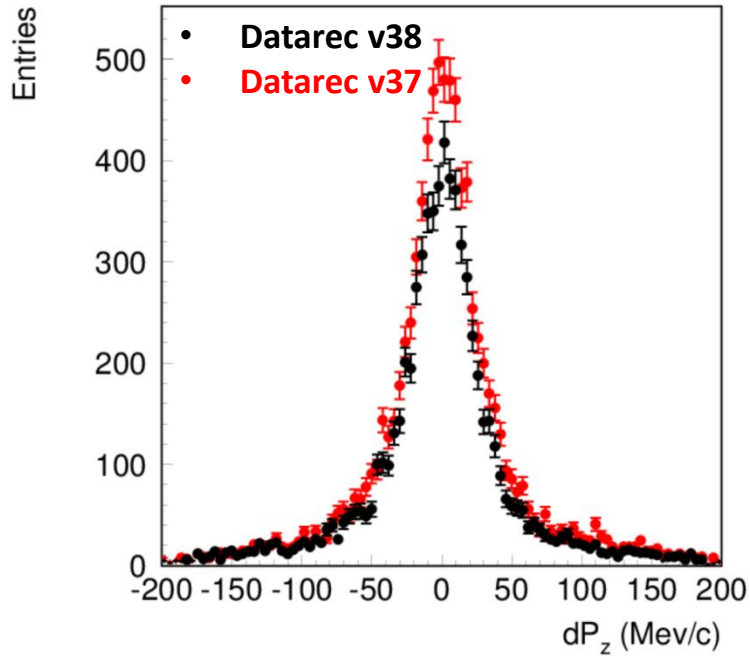

Entries
Datarec v38
Datarec v37
E_{min}(MeV)

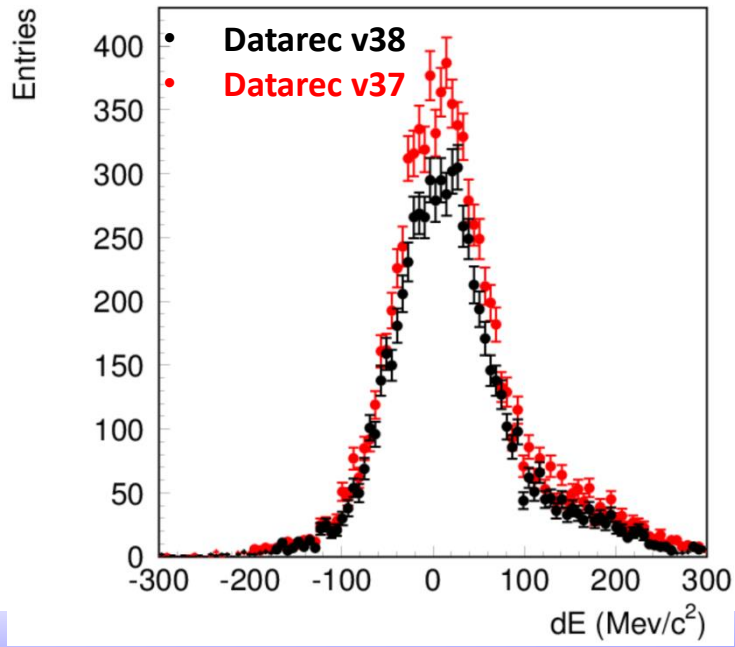
4γ sample

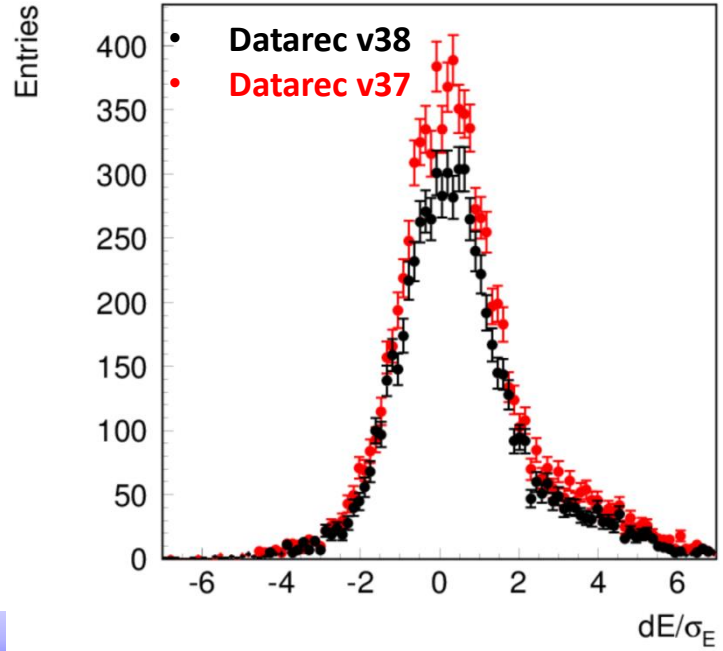

Datarec v38
Datarec v37
Entries
M_{Ks} (Mev/c^2)
$M^1_{\pi 0}$ (Mev/c^2)
$M^2_{\pi 0}$ (Mev/c^2)
dP_x (Mev/c)

4γ sample


Datarec v38
Datarec v37
Entries
dP$_y$ (Mev/c)


Datarec v38
Datarec v37
Entries
dP$_z$ (Mev/c)


Datarec v38
Datarec v37
Entries
dE (Mev/c^2)


Datarec v38
Datarec v37
Entries
dE/σ_E

4γ sample: resolutions and mean values

Quantity		Datarec v38	Daterec v37
M_{Ks} [MeV/c^2]	Mean	488.62 ± 0.76	488.39 ± 0.67
	Sigma	48.92 ± 0.78	48.3 ± 0.7
$M_{1\pi0}$ [MeV/c^2]	Mean	132.73 ± 0.32	132.3 ± 0.3
	Sigma	18.63 ± 0.37	18.99 ± 0.36
$M_{2\pi0}$ [MeV/c^2]	Mean	132.50 ± 0.34	132.60 ± 0.29
	Sigma	19.52 ± 0.41	19.08 ± 0.34
dP_x [MeV/c]	Mean	1.90 ± 0.43	2.11 ± 0.39
	Sigma	27.78 ± 0.46	28.23 ± 0.43
dP_y [MeV]	Mean	-0.39 ± 0.44	0.64 ± 0.39
	Sigma	28.00 ± 0.48	27.66 ± 0.42
dP_z [MeV]	Mean	0.52 ± 0.42	0.95 ± 0.34
	Sigma	21.10 ± 0.54	20.77 ± 0.48
dE [MeV]	Mean	7.92 ± 0.84	8.50 ± 0.75
	Sigma	49.0 ± 0.9	48.25 ± 0.81

Summary

Track Veto → χ^2_{fit} → $\Delta E/\sigma_E$ → Sbox → R_{min} → counting

	v37	v38
All	129388	90061
4 γ all	6723	6459
4 γ selected (standard KI-crash)	6381	6094
4 γ selected (hard KI-crash)	4201	4133
6 γ all	15504	14511
6 γ selected (standard KI-crash)	7	5
6 γselected (hard KI-crash)	2	2

- For $K_s \rightarrow 3\pi^0$ with the present analysis chain and cuts values we count $N_{obs} = 2$ events selected as a signal (hardening a bit R_{min} cut we can go down to 1 candidate) in ~ 64 pb^{-1} of data reconstructed with datarec v38

Summary

- Preselection was finally moved to the gpfs
- **TO DO:**
- Determination of the splitting and acciental probabilities based on data (Szymon Parzych, almost finished)
- Simulations tuning (Calorimeter energy scale and resolution)
- Refining the kinematic fit
- Refining the discriminant variables
- Two analyses in paralell: cuts-based (M. Silarski) & MVA-based (Sz. Parzych)
- For the preliminary result it wuld be nice to have all_phys generation with LSF > 1 + signal for the whole dataset