WP2: Anlysis Updates

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Analysis tasks

- In Cagli we had fruitful discussion on the most relevant task and topics to be covered by the experiment

- I updated and rearrenged the analysis task in a -hopefully- clearer way. Sign up! (find the link in this slide or in the WIKI of the cygnusRD github page)

AmBe is not missing,

it is simply not a task but a tool

There are also lower priority side quests but we should focus on main ones

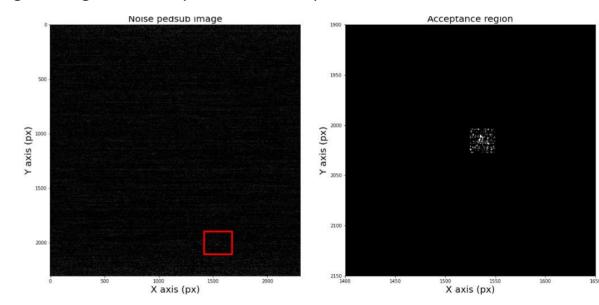| Priority Level	Macro task	Task	Person
	Dark Matter Analysis (limit and fit studies)	Test realistic cuts and background for LIME	
		Add News-G limit in SD limit	
		Implement energy and angle in statistical analysis in BAT	
	3D Reco	Continue David studies on 3D	
		Test directionality of low energy track (find a threshold of 3D)	
		Test with data at 5 GS/s	
		Test on AmBe	
		3D on electron recoils	
	ER/NR discrimination	Improve shape variables including 3D when possible	Luan, Jordan, Trieste(?)
		Test on simulated data machine learning and other things to get discrimination	Luan, Jordan, Trieste(?)
		Find discrimation power of CYGNO on data (use AmBe high gain and low gain data)	
	LIME Background analysis	Study effect on low energy range of Rn contamination	Daniel
		Normalisation table of iron of all Runs	Rita A
		Tweak on Run4 data analysis (rho and eta vs sc_integral, test absolute z measurement for LY response...)	Daniel
		Run4-MC comparison	
	Head-tail angular resolution on NR	Use AmBe data to study this	
		Improve directionality code	
		Same on ER	DavideF, Giorgio
1	Z-fiducialization	Improve current status of resolution	
		Analyse the scans taken for z-fiducialization studies	
		Test on data with different z	
	Energy Threshold and efficiency	Determine E_thr and efficiency as a function of energy and Z in all high and low gain (use data of scan of VGEM1)	
	Low gain data analysis	Find effect of cuts and noise intensity on energy threshold	Pedro
		Compare Run4 low gain to high gain energy spectrum	Pedro
		Compare Run4 low gain to high gain angular performances	
		Same with Run5	Melba
	Run5 neutron Analysis	Study the neutron flux at LNGS	Melba
	Data reduction and pixel selection	Test with similar machinery, the anomaly detection training on pedestals	IgorP
		Improve the algorithm to accept stream of data not images (Task shared with WP5)	Stefano, Giorgio, IgorP
	PMT analysis improvements	Rate estimation of Run*	
		Spectra of Run*	
	Improve reconstruction code	Implement barrel correction	Giorgio
		Improve selection of signal clusters	Guilherme, Rafeal

Trigger image selection (I. Pains)

- Updates after Cagli suggestions

- Simple zero suppression does not work

- Possible new approach:
  identify centroids with large intensity likely not to belong to background and open a window of pixels around

- Very fast but to be further tested in terms of:
    - Signal efficiency
    - Noise rejection
    - Total pixel saved

Applied to image level you would trigger whole pictures of noise, **no advantage**

Applied to pixels even with gaus filter, cuts half of signal pixels

- Machine learning autoencoders could be a viable option to train on pedestal and identify anomalies