



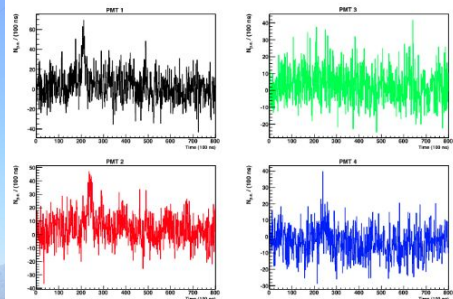
Astročásticová témata

Vlastimil Jílek za Astročásticovou skupinu SLO

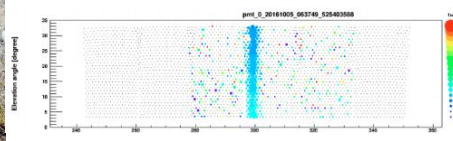
FAST



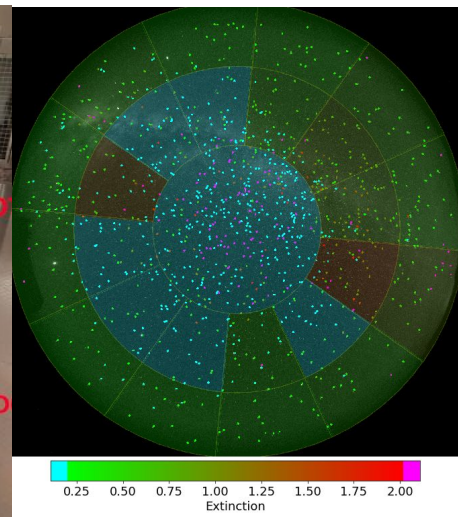
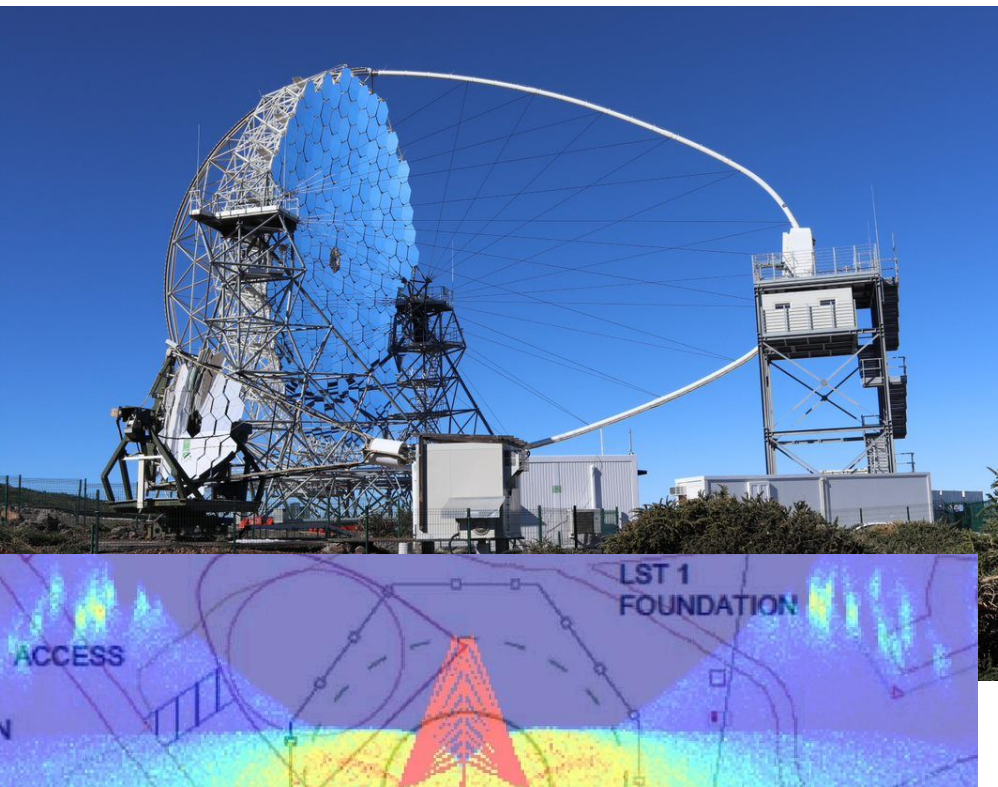
① 2016/10/05 06:37:49.525424540



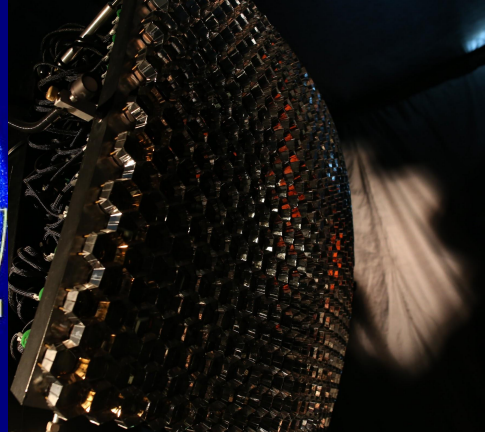
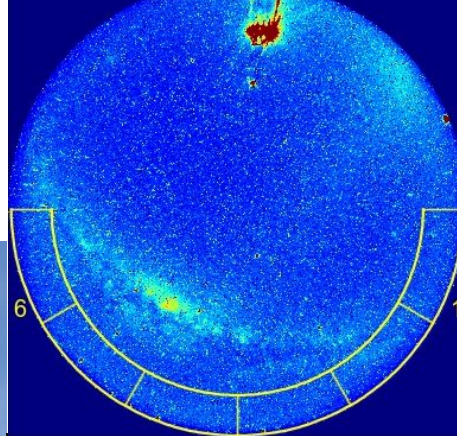
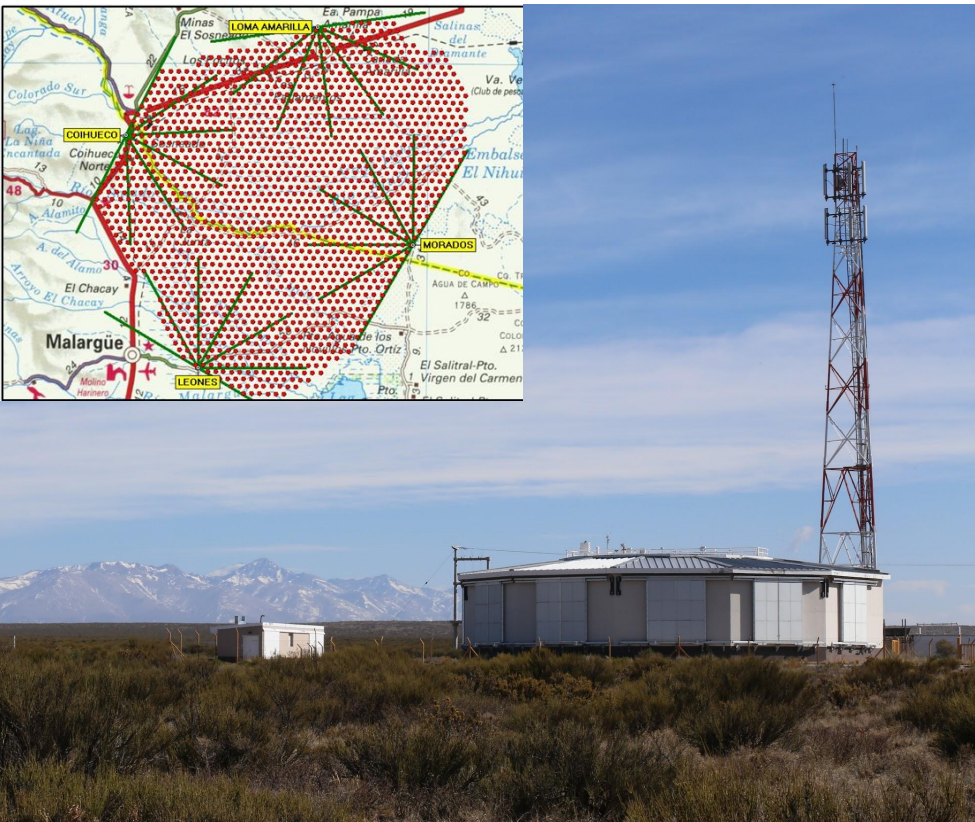
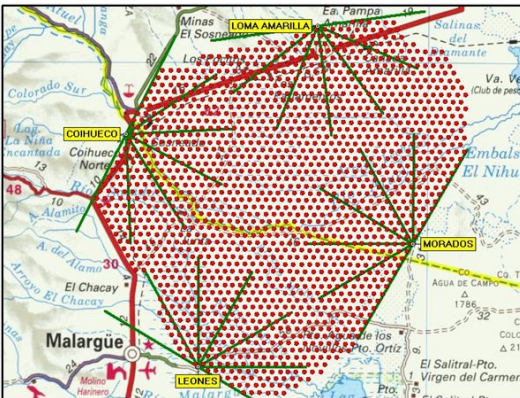
TAFD reconstruction
 $\log E = 18.08$, $R_p = 2.40 \text{ km}$



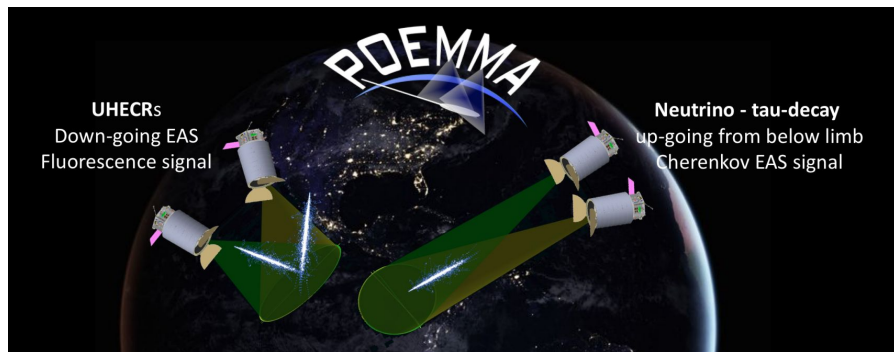
Cherenkov Telescope Array



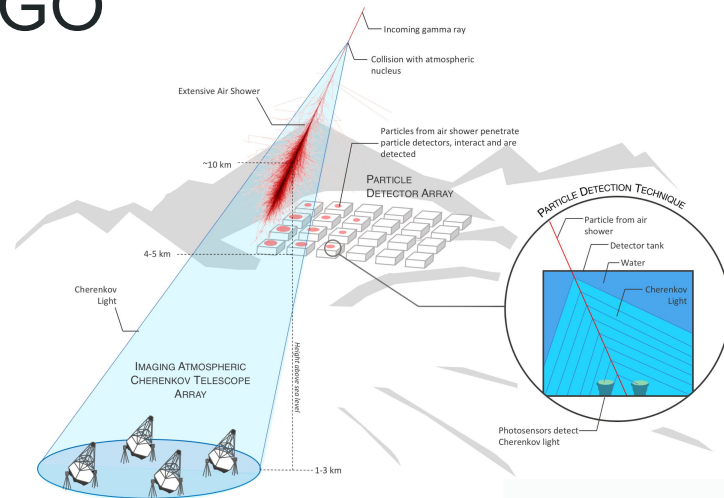
Observatoř Pierra Augera



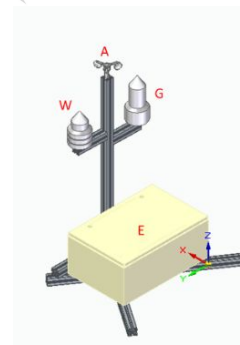
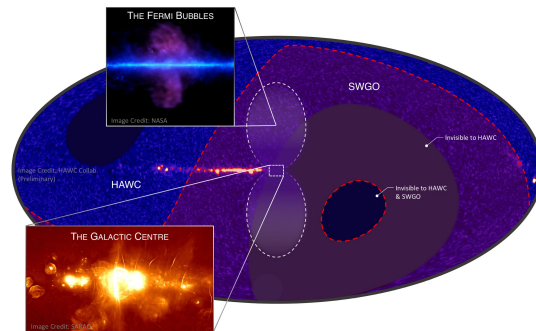
POEMMA + EUSO-SPB



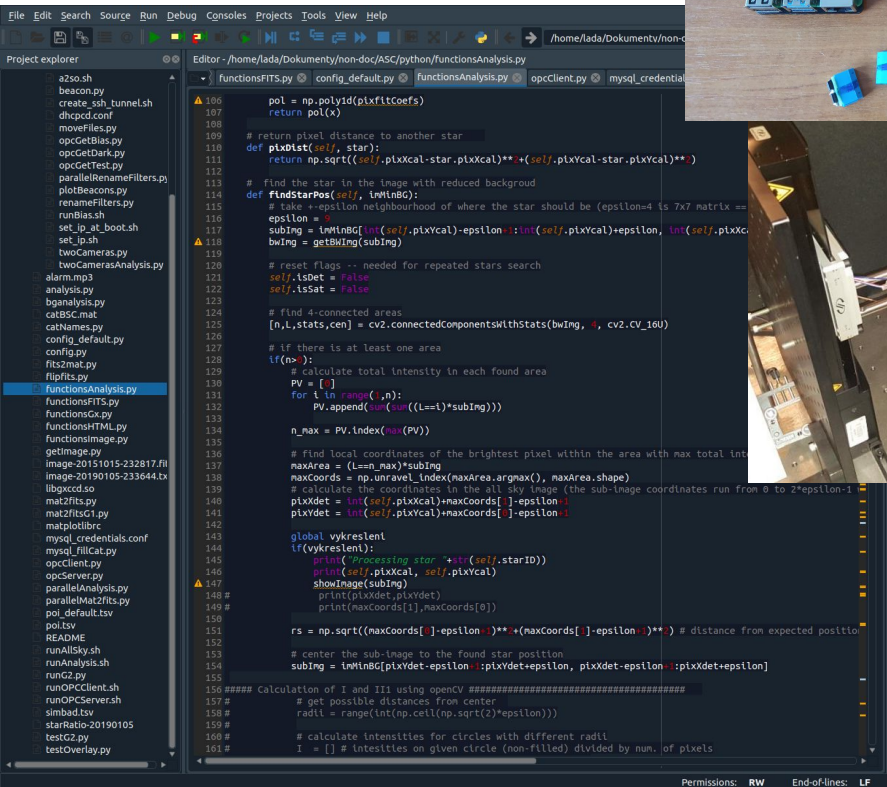
SWGO



Shower image, 300 GeV, gray adapted from F. Schmidt, J. Knapp, "COSMOS Shower images", 2005, <https://www.usatoh.dtu.dk/~jknapp/tycho/showerimages.html>



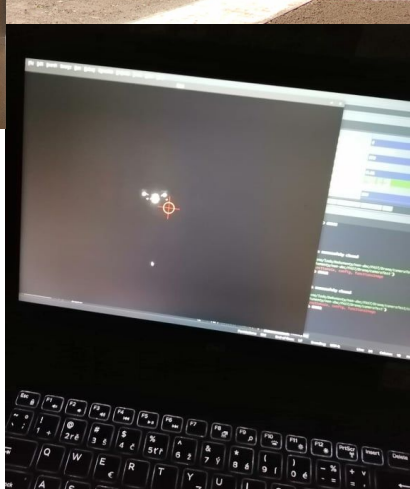
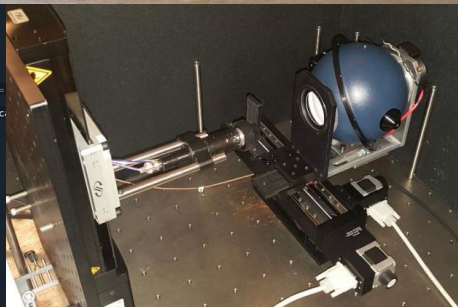
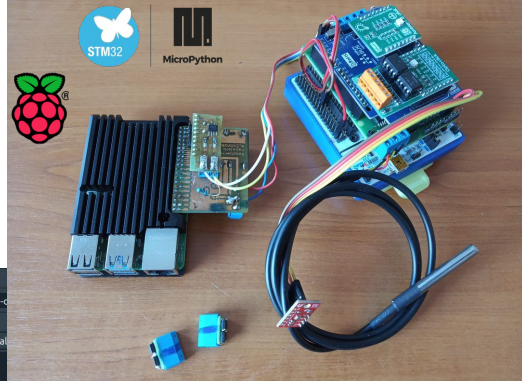
Náplň práce



```
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testC2.py
testOverlay.py

Editor - /home/lada/dokumenty/non-don/ASC/python/functionsAnalysis.py
functionsFITS.py config_default.py functionsAnalysis.py opcClient.py mysql_credentials.py

106 pol = np.polyid(plxfitsCoeffs)
107 return pol(x)
108
109 # return pixel distance to another star
110 def plxDist(self, star):
111     return np.sqrt((self.plxXcal-star.plxXcal)**2+(self.plxYcal-star.plxYcal)**2)
112
113 # find the star in the image with reduced background
114 def findStarPos(self, tminBG):
115     # take +epsilon neighbourhood where the star should be (epsilon=4 is 7x7 matrix ==
116     epsilon = 4
117     subimg = tminBG[set(self.plxYcal-epsilon:int(self.plxYcal)+epsilon, int(self.plxXcal-
118     bwing = getBKG(subimg)
119
120 # reset flags -- needed for repeated stars search
121 self.isDet = False
122 self.isSat = False
123
124 # find 4-connected areas
125 [n,l,stats,cen] = cv2.connectedComponentsWithStats(bwing, 4, cv2.CV_16U)
126
127 # if there is at least one area
128 if(n>0):
129     # calculate total intensity in each found area
130     pv = []
131     for t in range(1,n):
132         PV.append(sum((l==t)*subimg))
133
134     n_max = PV.index(max(PV))
135
136 # Find local coordinates of the brightest pixel within the area with max total intensity
137 maxArea = (L==n_max)*subimg
138 maxCoords = np.unravel_index(maxArea.argmax(), maxArea.shape)
139 # calculate the coordinates in the all sky image (the sub-image coordinates run from 0 to 2*epsilon-1)
140 plxDet = int(self.plxYcal)+maxCoords[1]-epsilon
141 plxDet = int(self.plxYcal)+maxCoords[1]-epsilon
142
143 global vykreslent
144 if(vykreslent):
145     print(f"Processing star {str(self.starID)}")
146     print(self.plxXcal, self.plxYcal)
147     showImage(subimg)
148     or int(plxDet, plxDet)
149     print(maxCoords[1], maxCoords[0])
150
151 rs = np.sqrt((maxCoords[0]-epsilon)**2+(maxCoords[1]-epsilon)**2) # distance from expected position
152
153 # center the sub-image to the found star position
154 subimg = tminBG[plxDet-epsilon:plxDet+epsilon, plxDet-epsilon:plxDet+epsilon]
155
156 ##### Calculation of I and III using openCV #####
157 # get possible distances from center
158 radii = range(int(np.ceil(np.sqrt(2)*epsilon)))
159
160 # calculate intensities for circles with different radii
161 I = [] # intensities on given circle (non-filled) divided by num. of pixels
```



Témata prací

Analýza kosmického záření gama v experimentu CTA

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Kosmické detektory částic

Školitel: Mgr. Jiří Kvita, Ph.D., jiri.kvita@upol.cz

Konzultant: RNDr. Karel Černý, Ph.D., karel.cerny@upol.cz

Soulad měření složení kosmického záření ultra-vysokých energií

Školitel: Ing. Jakub Vicha, Ph.D., vicha@fzu.cz

Konzultant: RNDr. Petr Trávníček, Ph.D.

Simulace a analýza dat z atmosférických spršek kosmického záření pro detektor FAST

Školitel: Mgr. Petr Hamal, Ph.D., hamal@fzu.cz

Konzultant: Mgr. Jiří Kvita, Ph.D., jiri.kvita@upol.cz

Provoz a kalibrace prototypu astročásticového experimentu FAST

Školitel: Ing. Ladislav Chytka, Ph.D., ladislav.chytka@upol.cz

Konzultant: Mgr. Dušan Mandát, Ph.D., dusan.mandat@upol.cz

Justáž a kalibrace astročásticových teleskopů pomocí dronu

Školitel: Ing. Ladislav Chytka Ph.D., ladislav.chytka@upol.cz

A detailed visualization of the cosmic web, showing a complex network of dark matter filaments and galaxy clusters. The filaments are depicted as glowing, tangled threads in shades of blue and orange against a deep black background. Numerous small, bright stars and distant galaxies are scattered throughout the structure.

Děkuji za pozornost