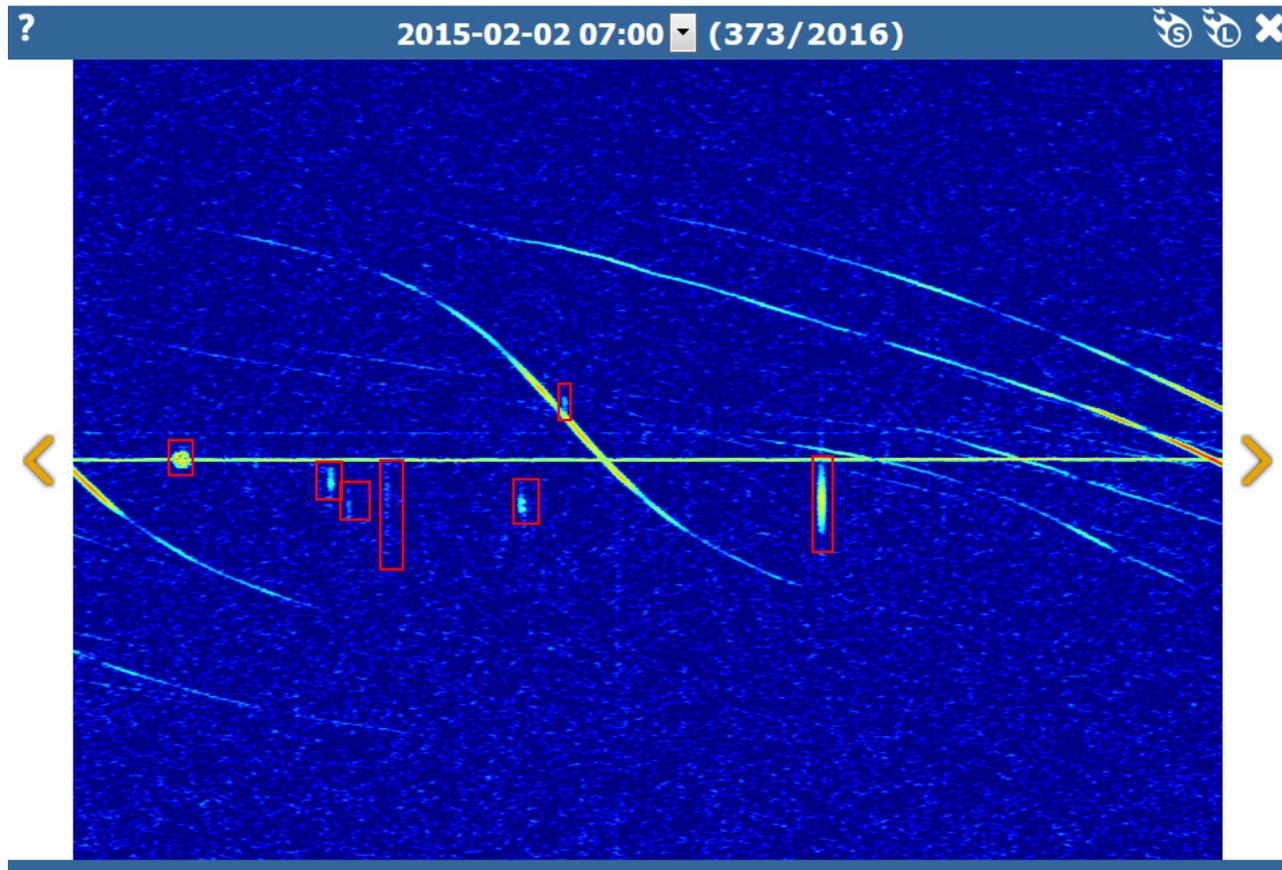


# New automatic detection method : description and some results

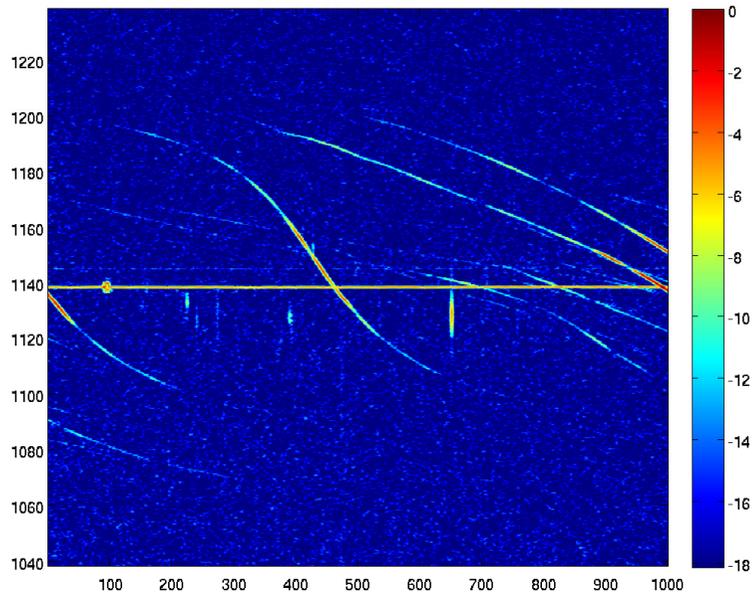
H. Lamy

# Example 1



Manual counts : 7

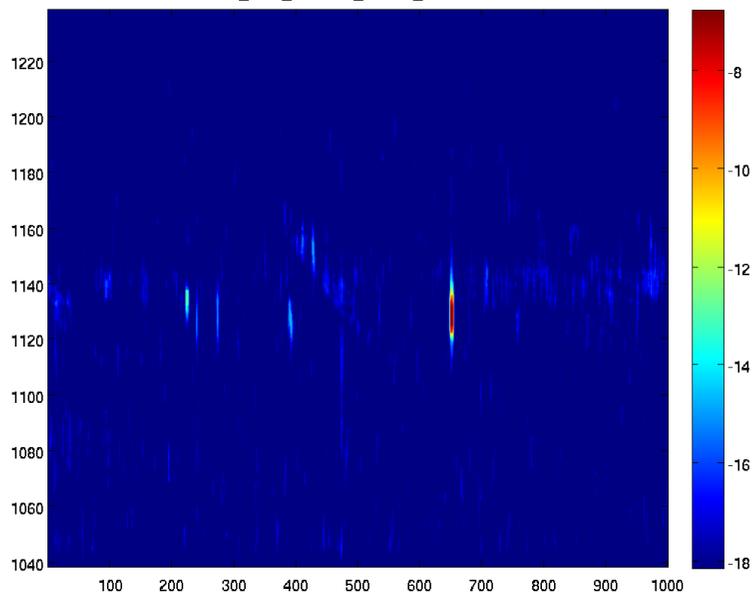
20150202\_0700\_BEOTTI: 16384-14746



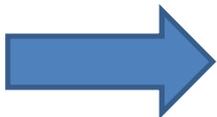
07H00

Median width =  
40 pixels

20150202\_0700\_BEOTTI\_filtered\_medianwidth=40



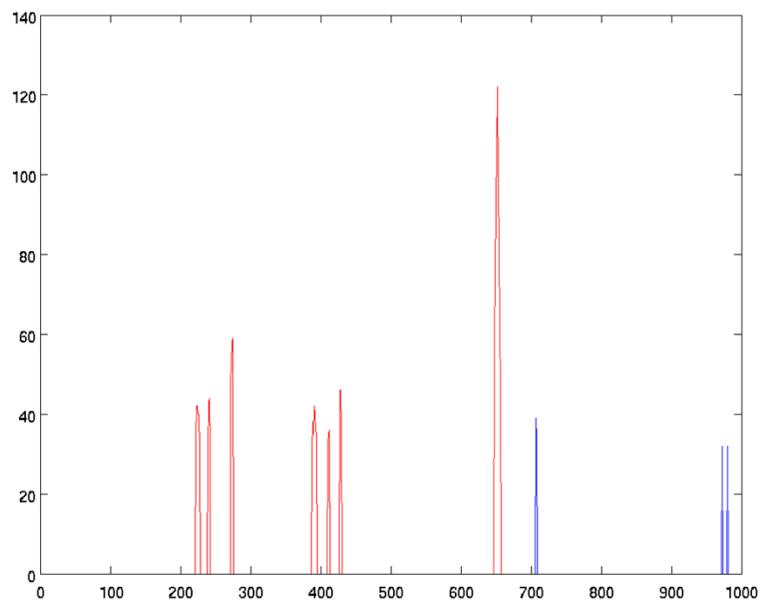
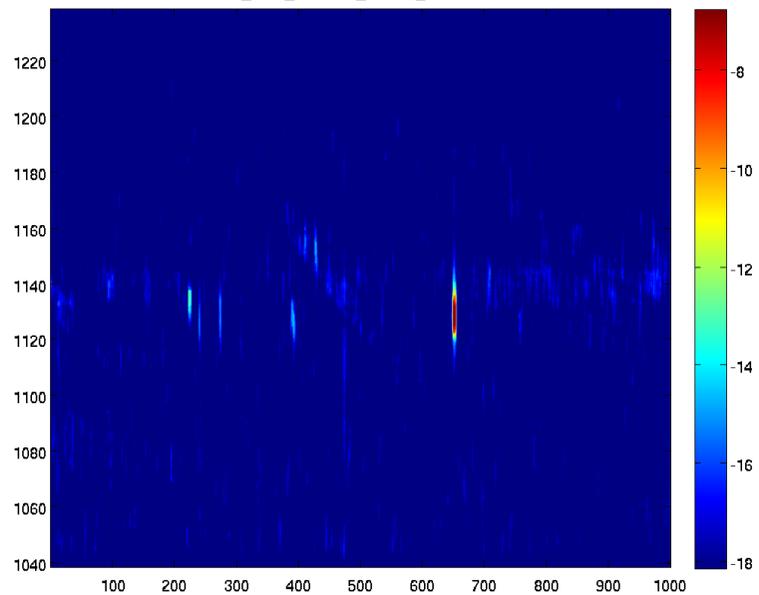
1. Binarisation of the image : 1 if value  $>$  threshold, 0 otherwise
2. For each column : labelisation  $\rightarrow$  set of « objects » with different lengths
3. If length of the object  $>$  min\_length\_value  $\rightarrow$  we keep this length value for this column, otherwise 0
4. the vector with the length values of the labeled objects is also labeled. I keep only those « new objects » that have a width  $>$  min\_width\_value



3 parameters :

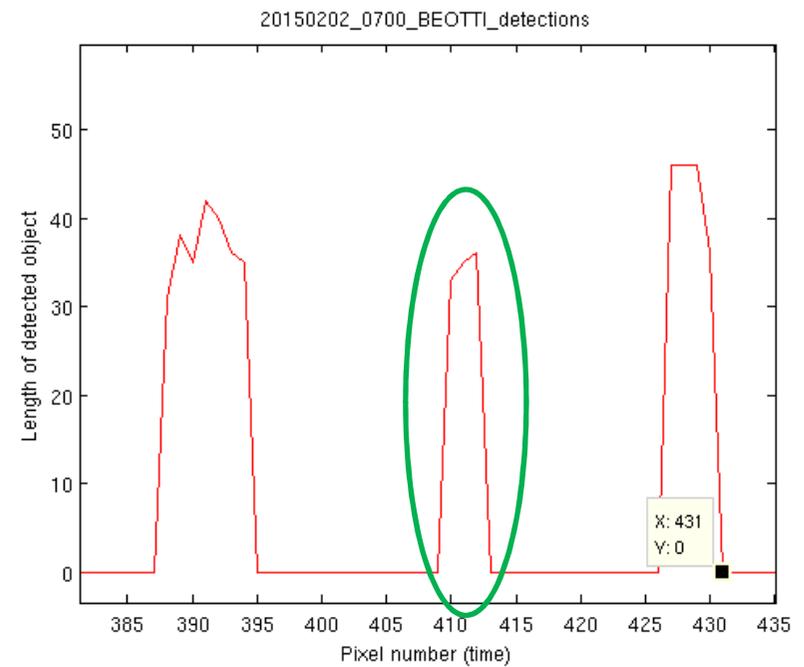
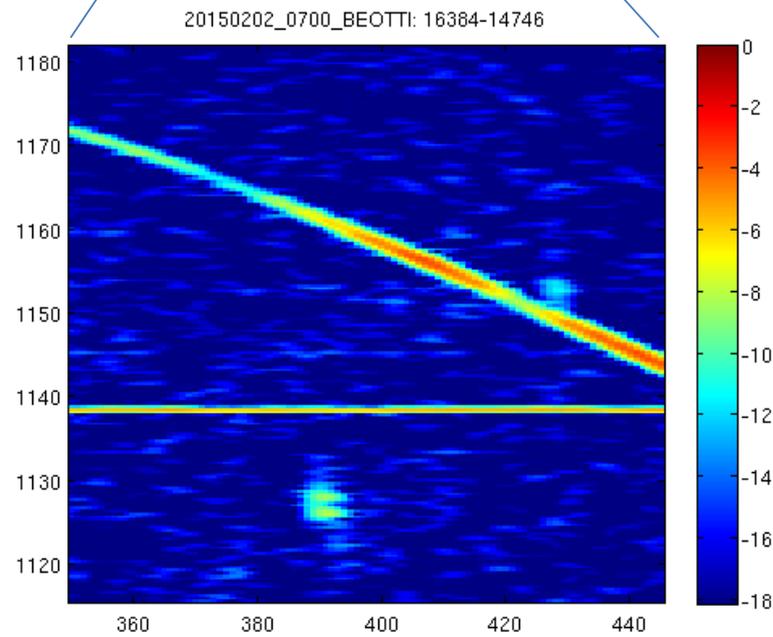
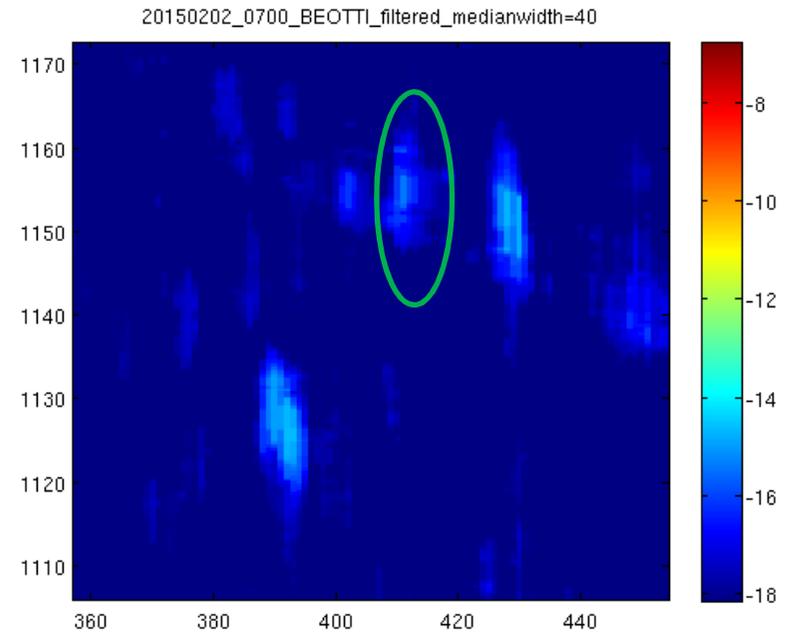
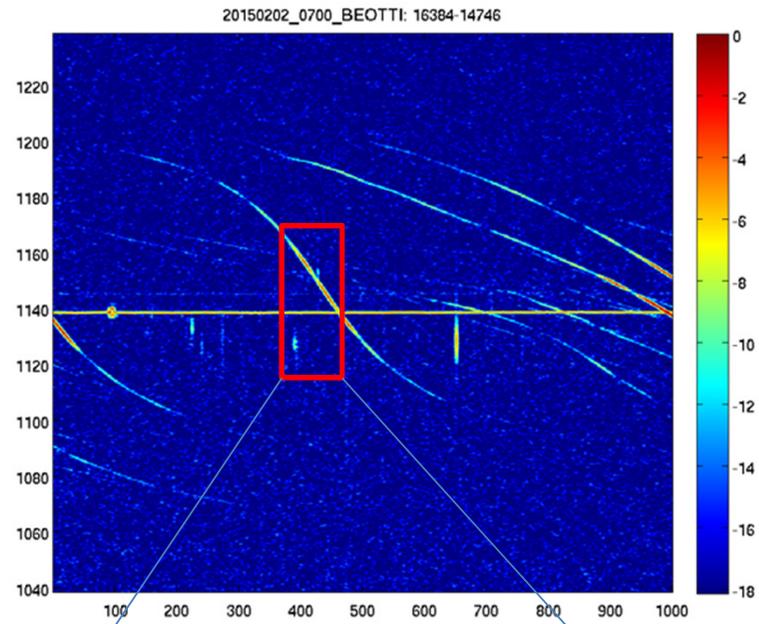
- Threshold : so far mean + 3 std of the whole image
- Min\_length\_value (in frequency) : 30 pixels
- Min\_width\_value (in time) : 3 columns

20150202\_0700\_BEOTTI\_filtered\_medianwidth=40



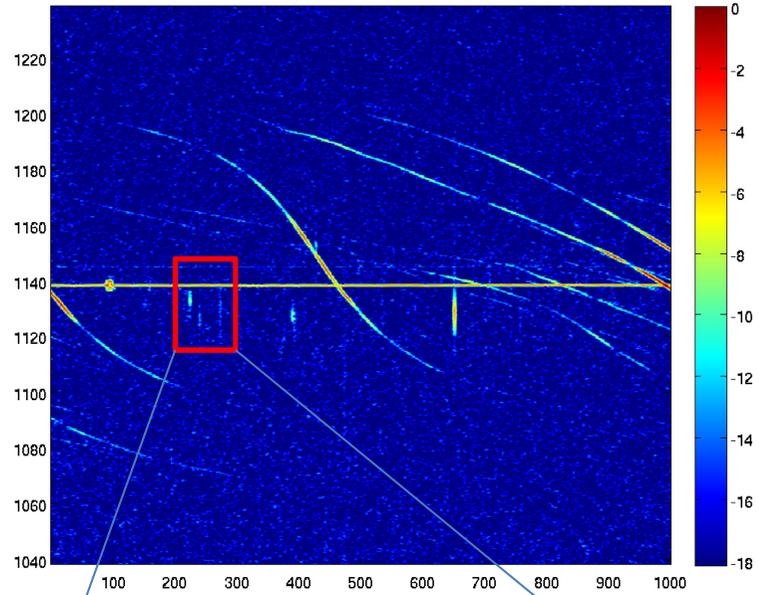
— Objects with enough length in frequency but not enough width in time

— Objects with enough length in frequency AND enough width in time

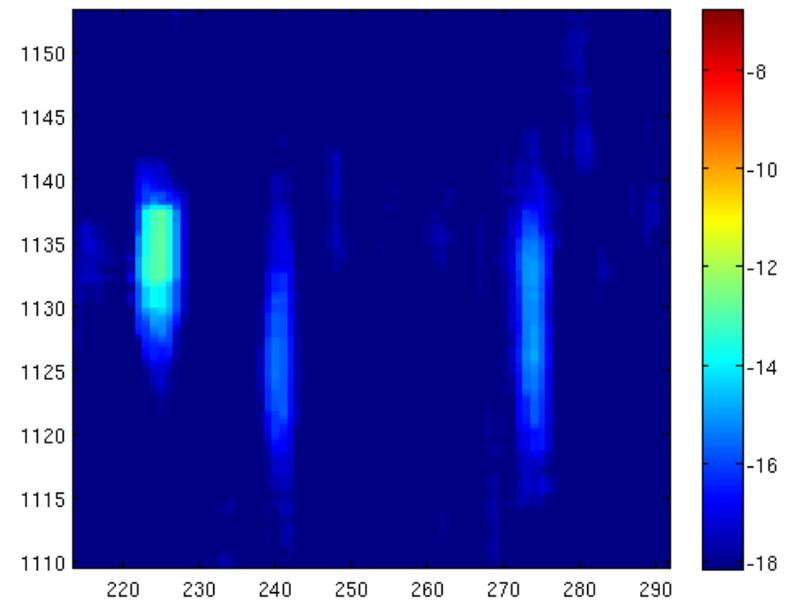


- Positive : faint meteor superimposed on bright plane is detected
- Negative : 1 FP  $\rightarrow$  solution : width  $\geq 4$  instead of width  $\geq 3$  ?

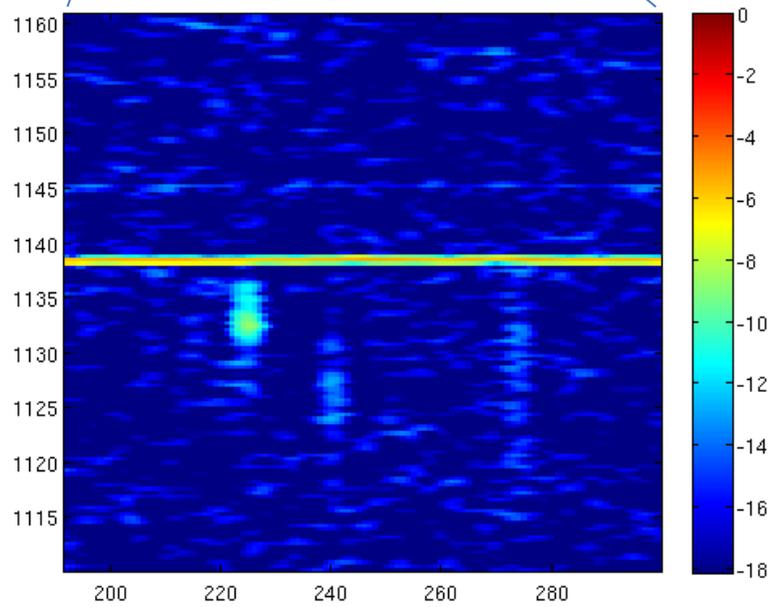
20150202\_0700\_BEOTTI: 16384-14746



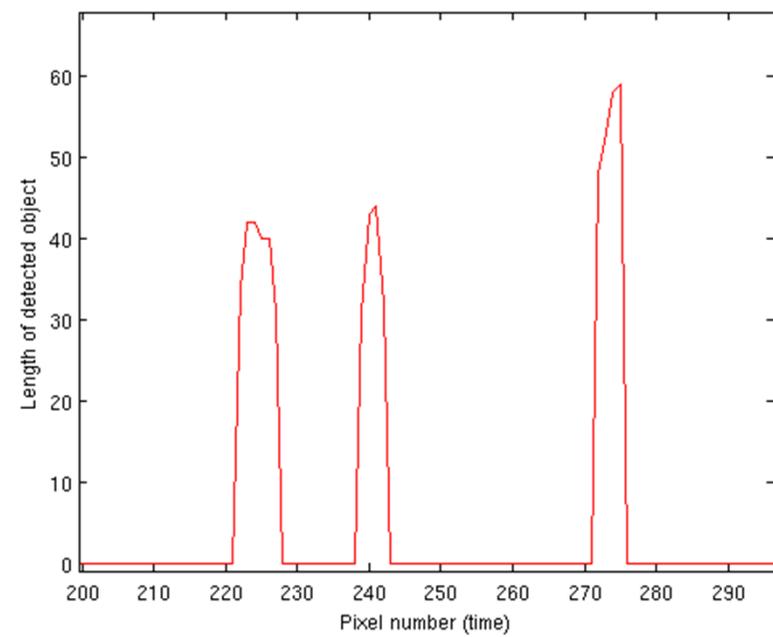
20150202\_0700\_BEOTTI\_filtered\_medianwidth=40



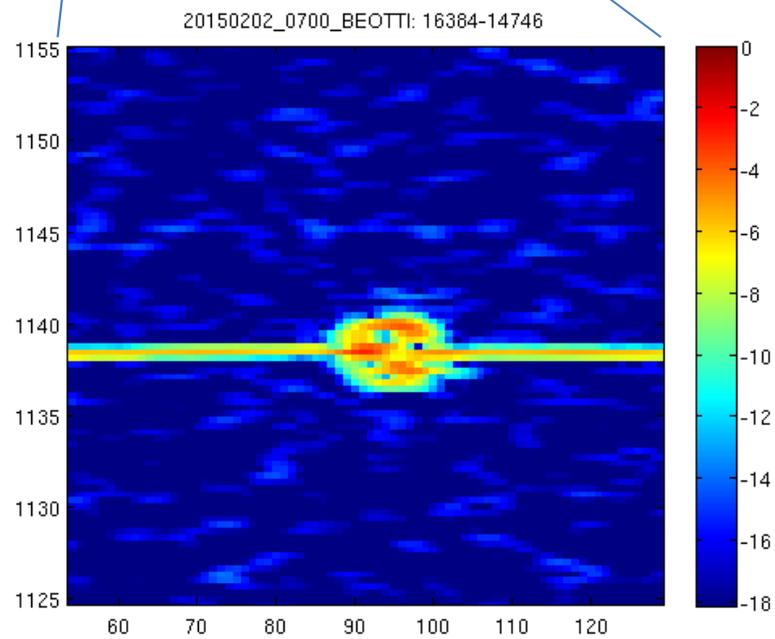
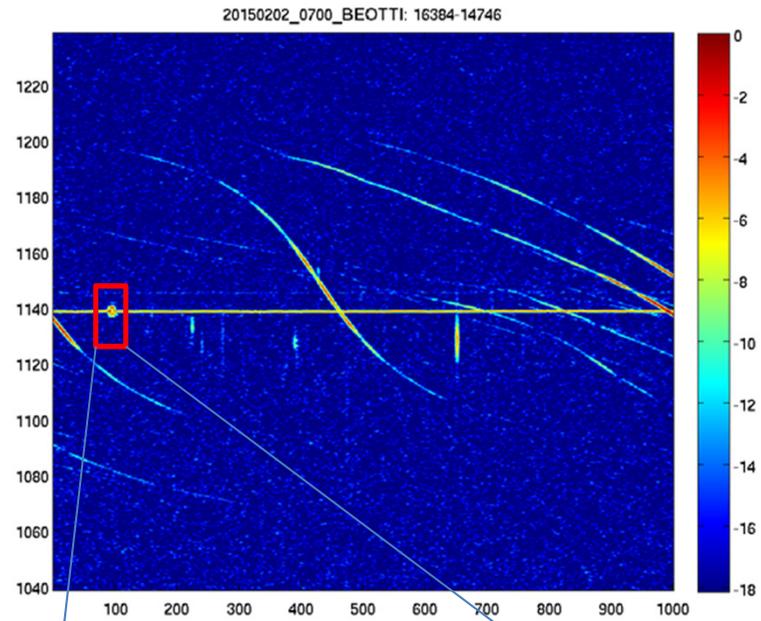
20150202\_0700\_BEOTTI: 16384-14746



20150202\_0700\_BEOTTI\_detections



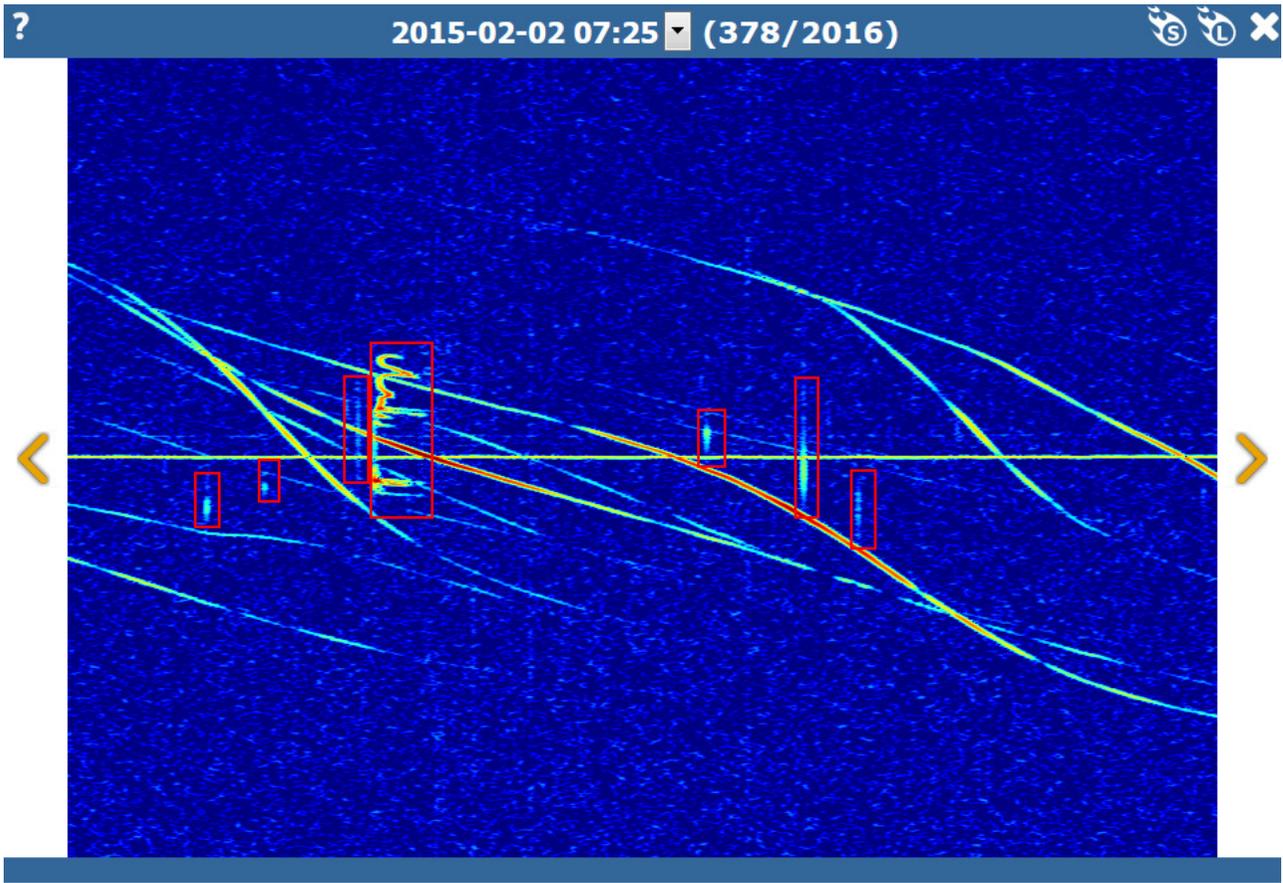
- Positive : all faint meteors are detected
- Negative : -



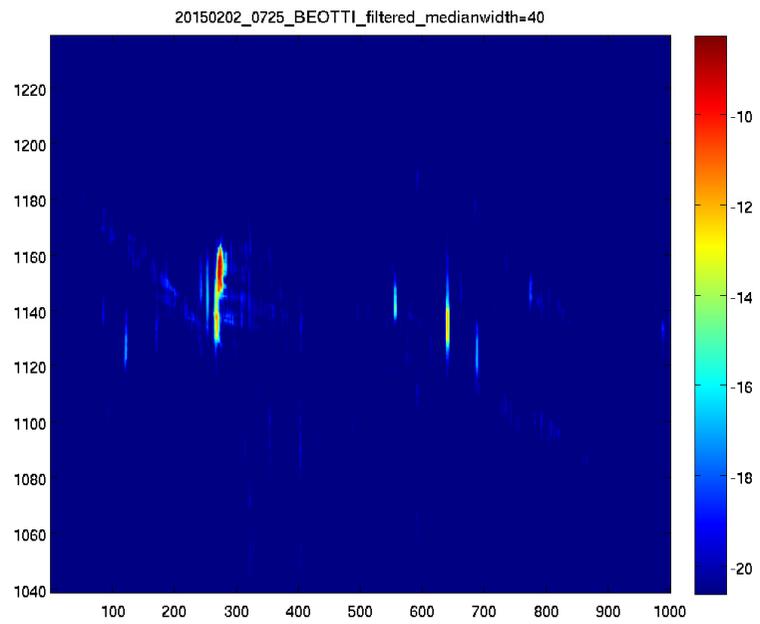
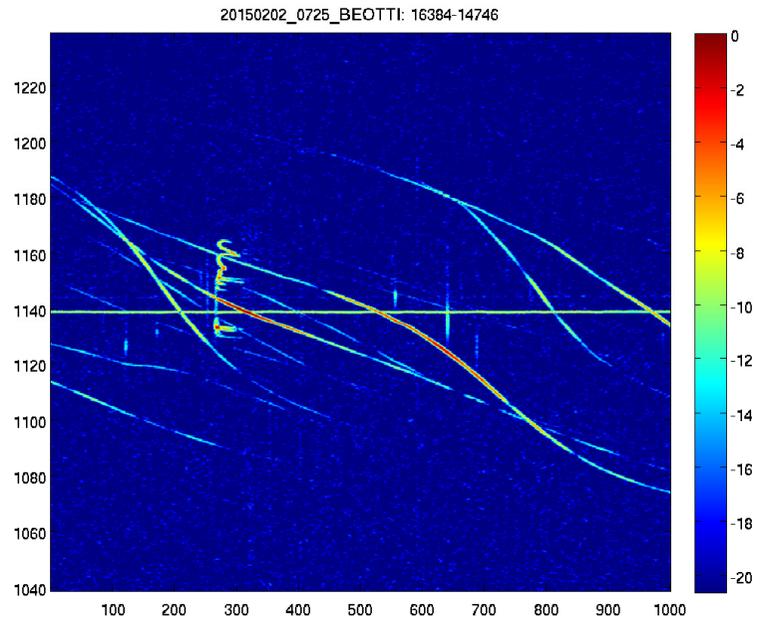
Summary :

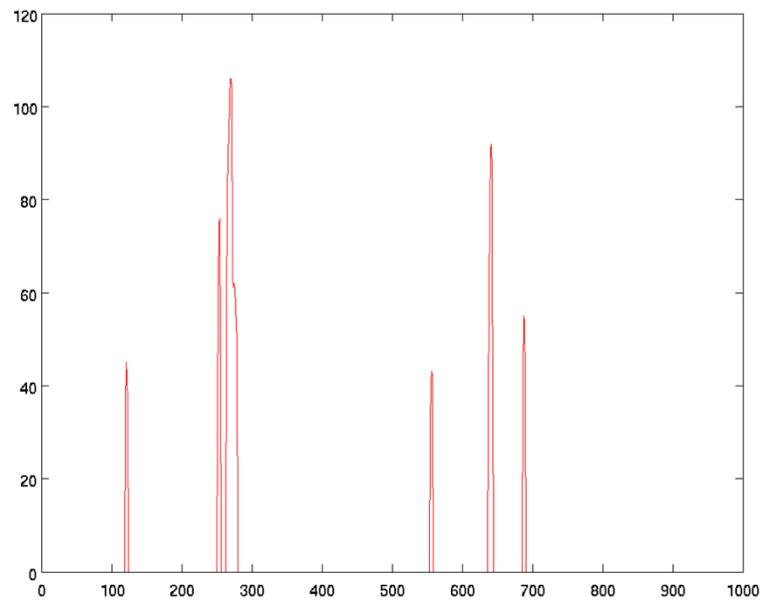
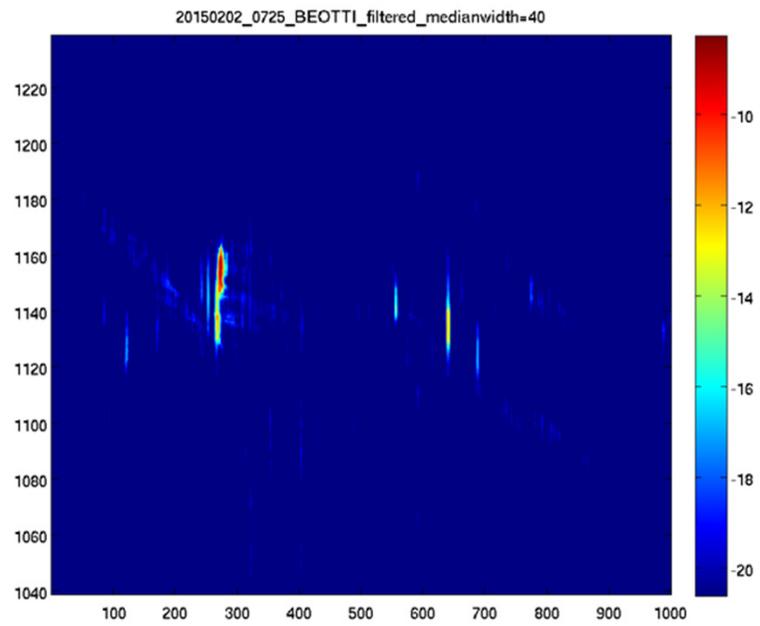
1. TP : 6/7
2. FP : 1 (can be avoided?)
3. FN : 1/7

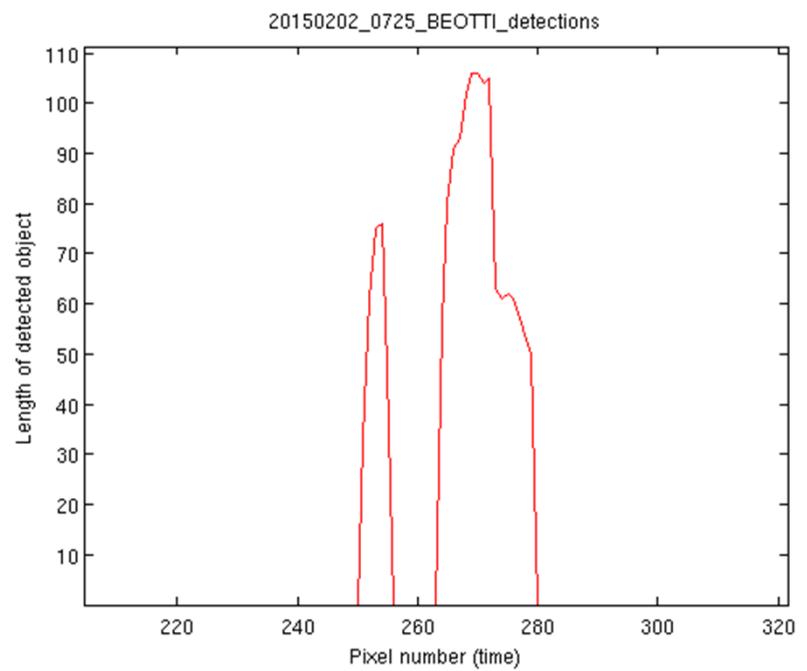
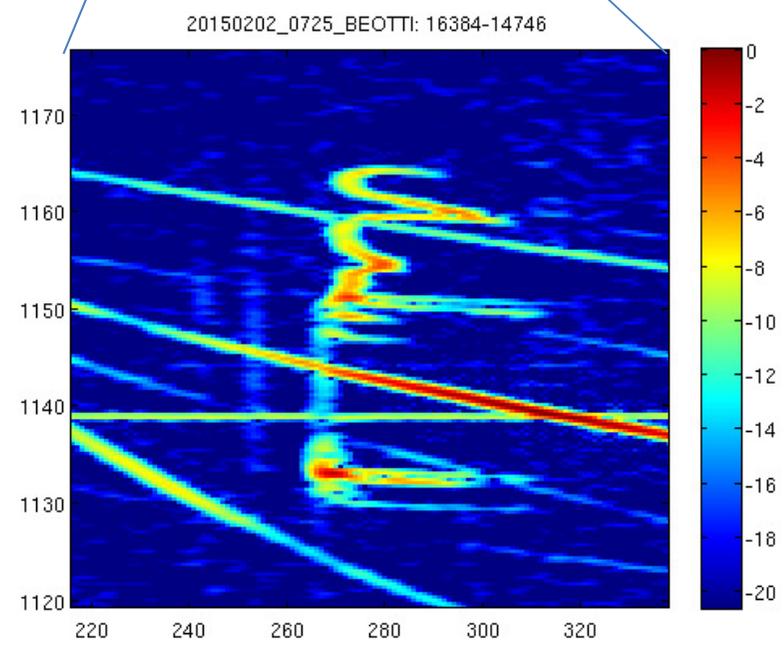
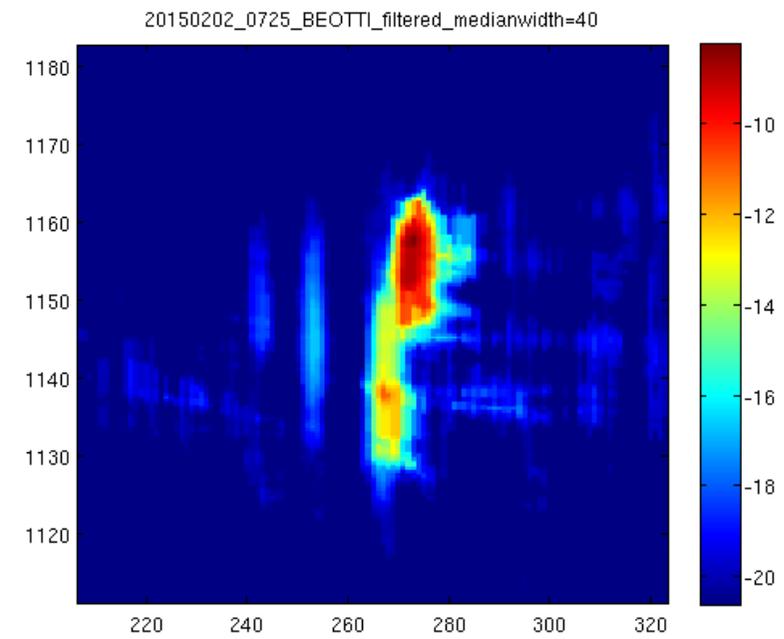
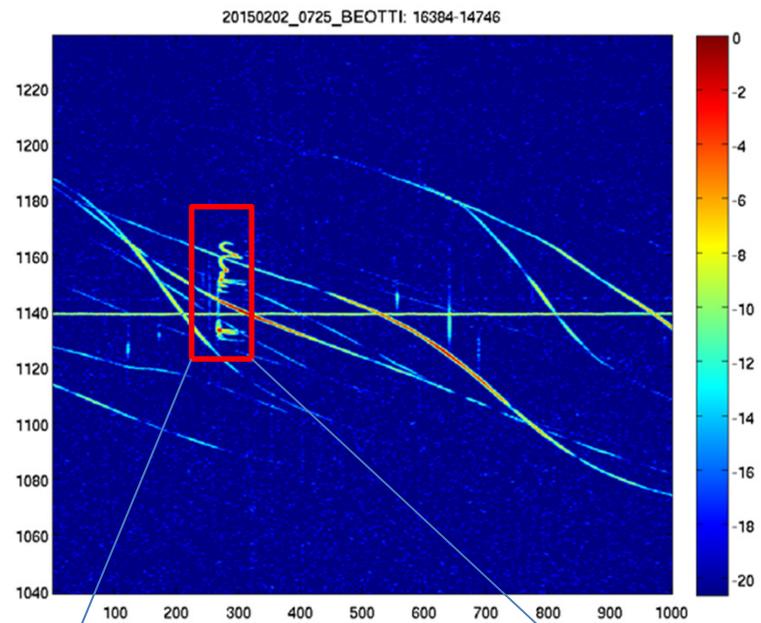
# Example 2



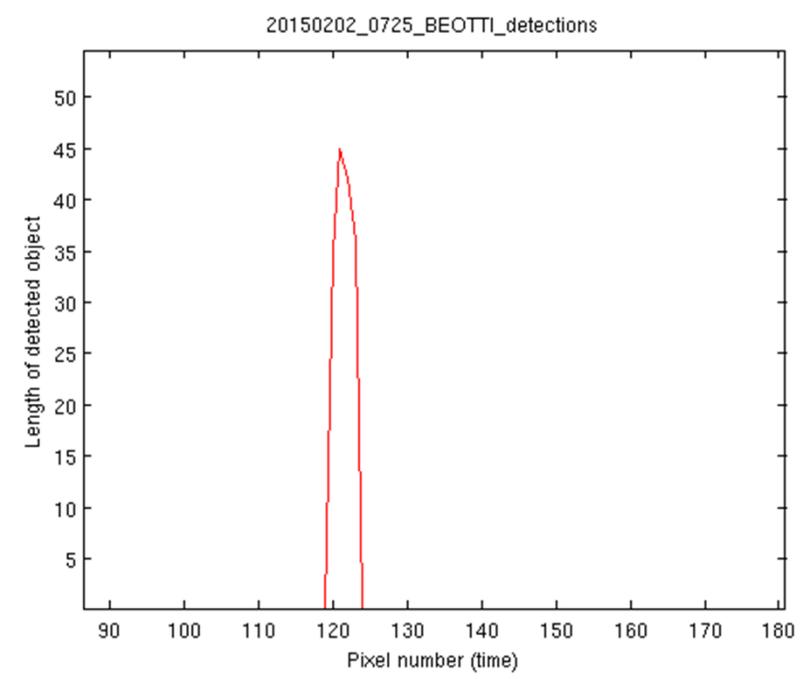
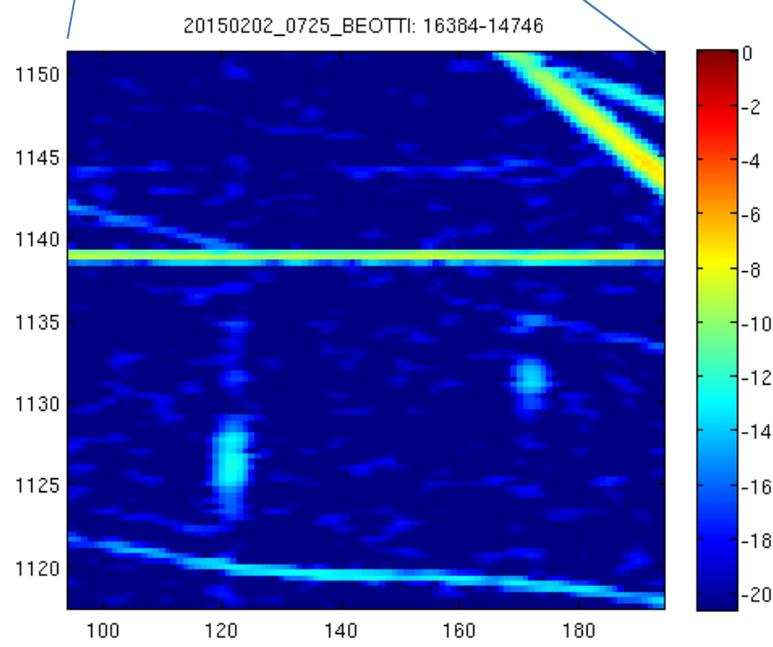
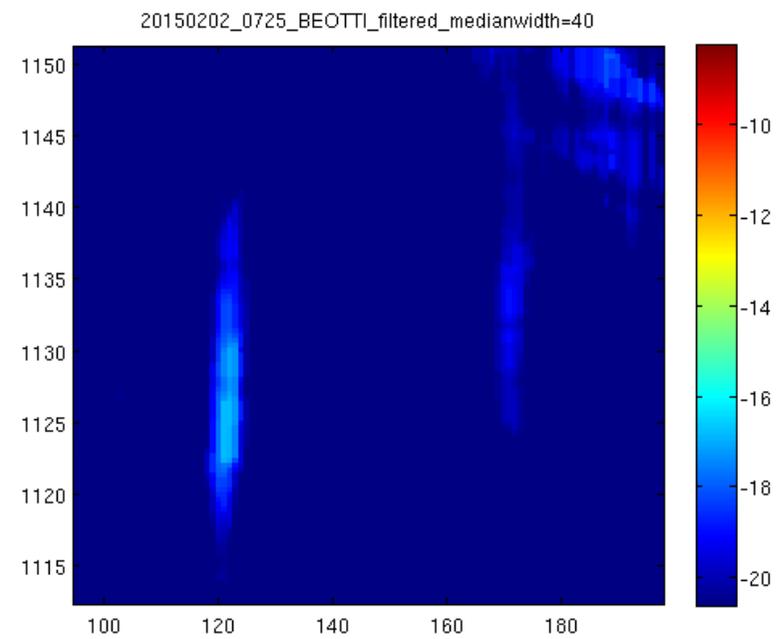
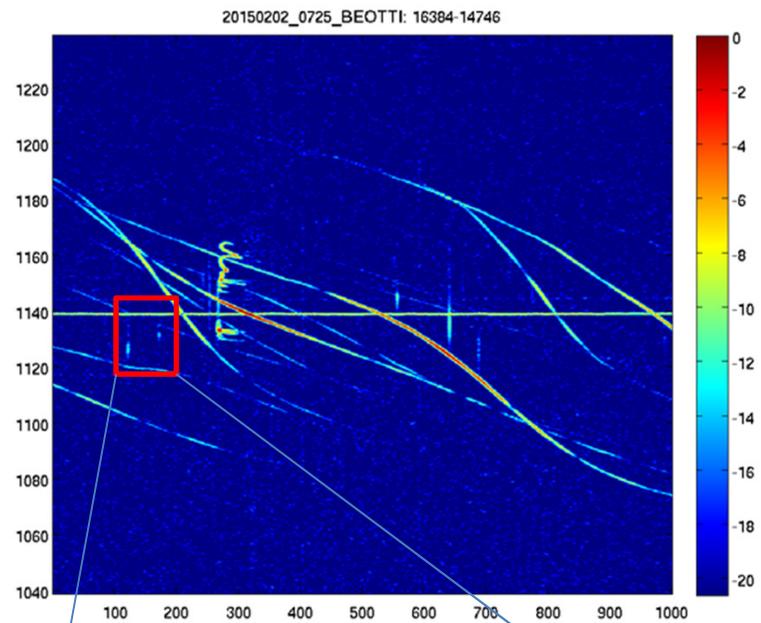
07H25

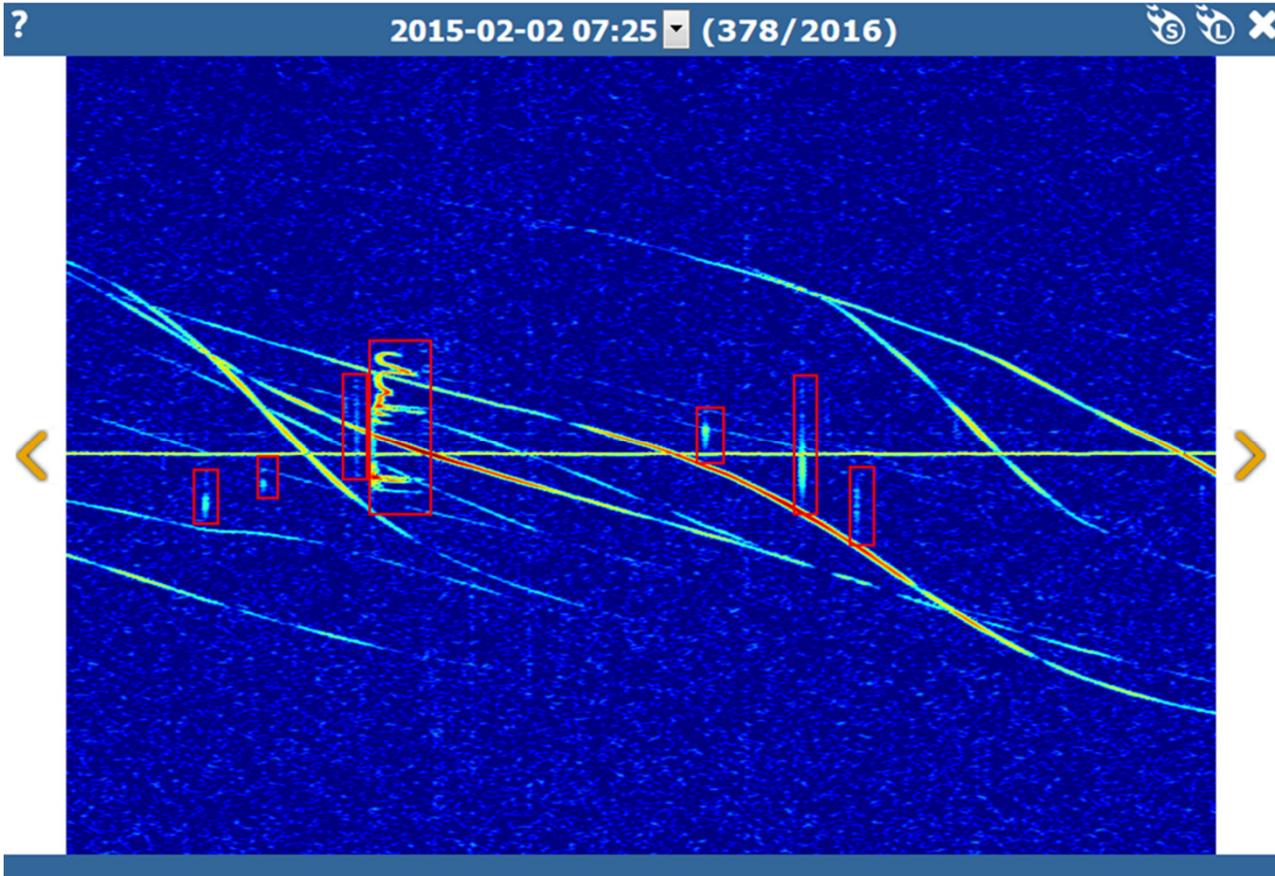






- Positive : the very faint but « long » meteor echo is clearly detected even though it is superimposed on bright planes
- Positive : the epsilon echo is detected, at least part of it. The long branches disappear due to the median filter.

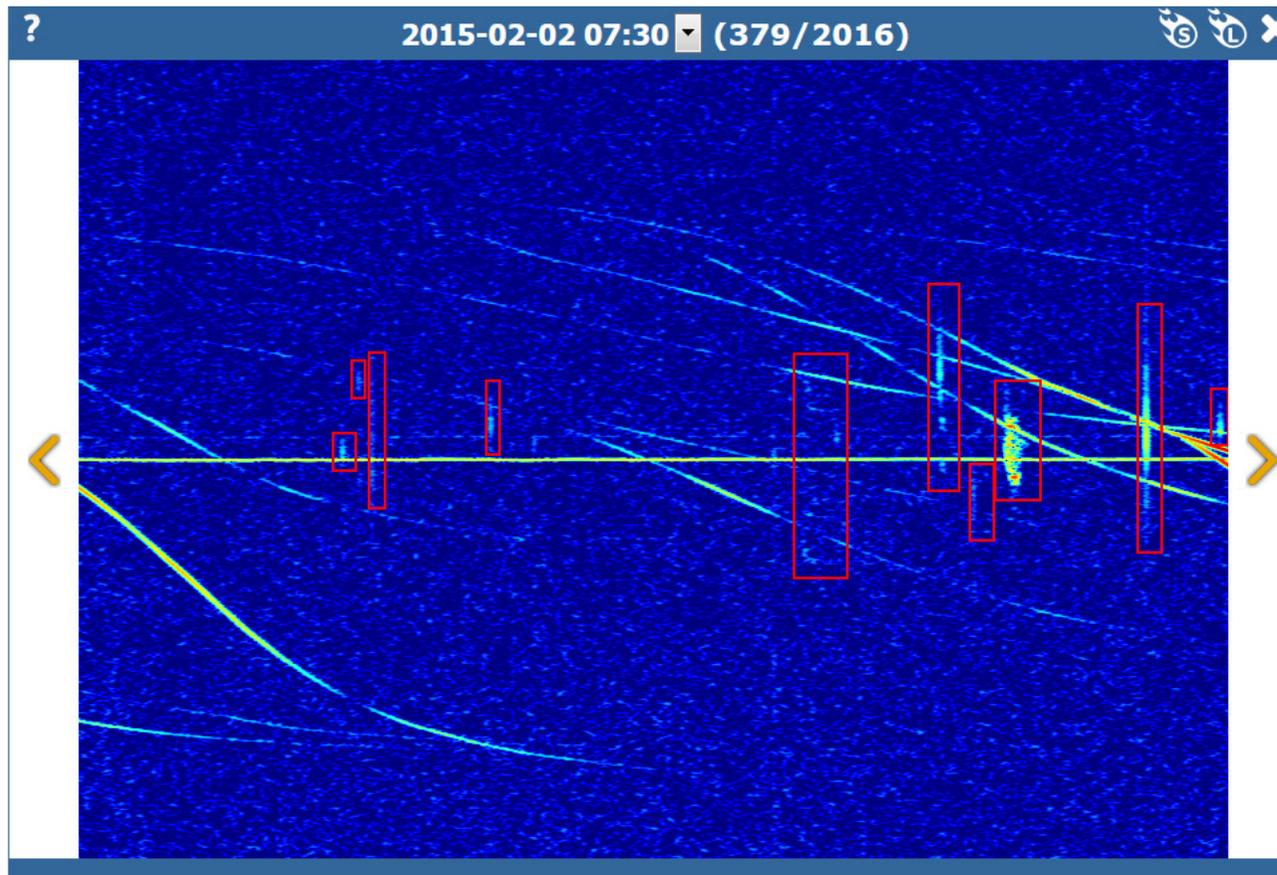




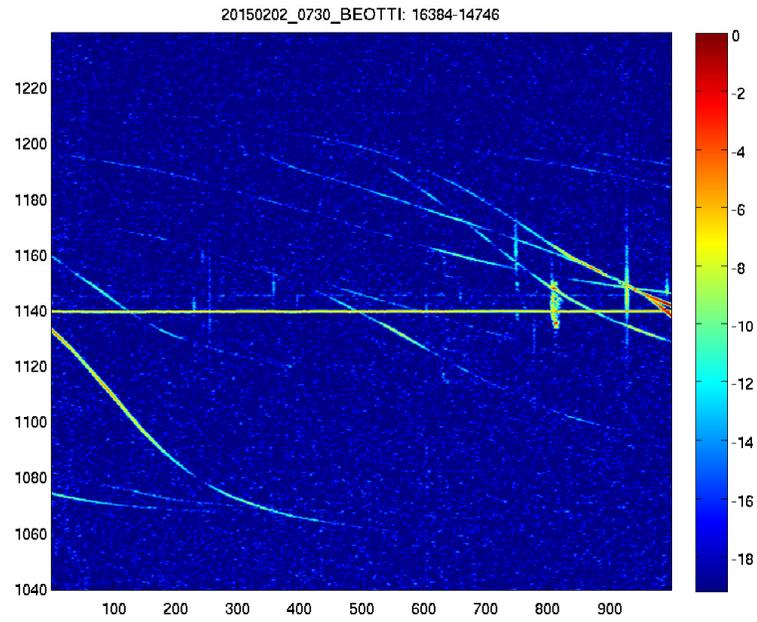
Summary :

1. TP : 6/7
2. FP : 0
3. FN : 1/7

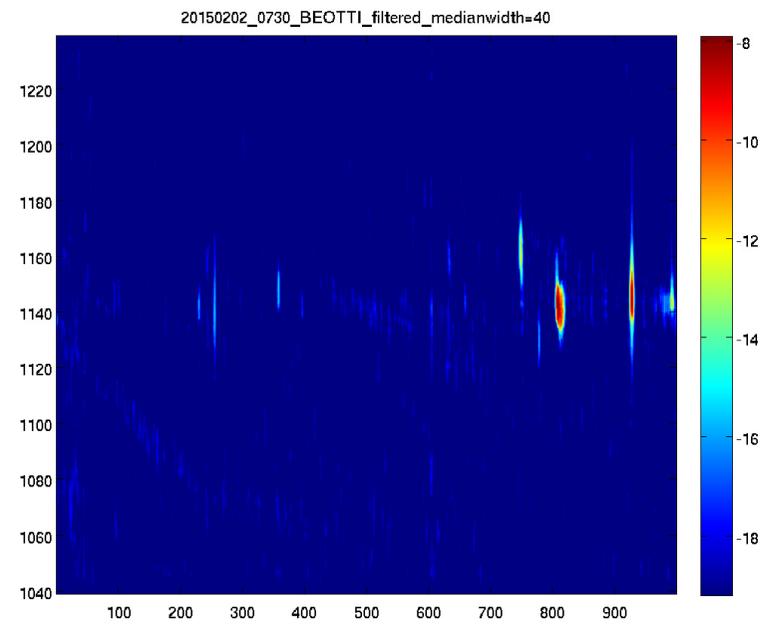
# Exemple 3

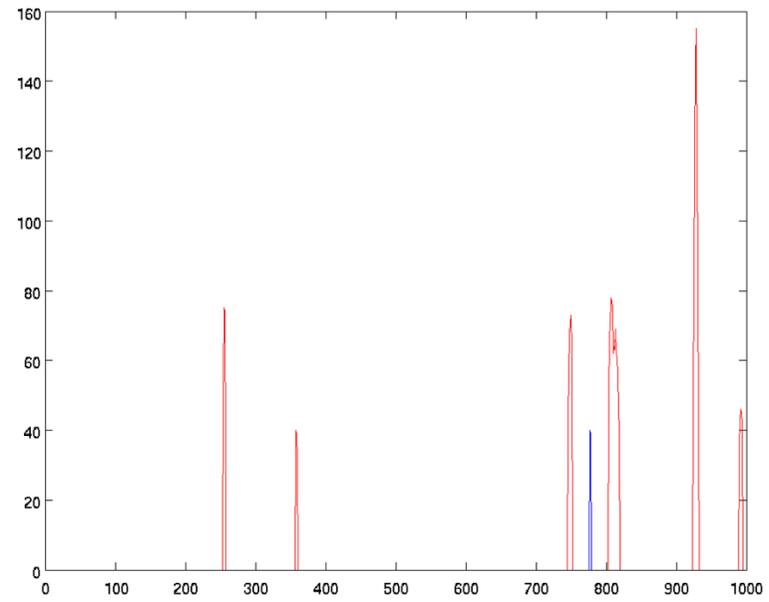
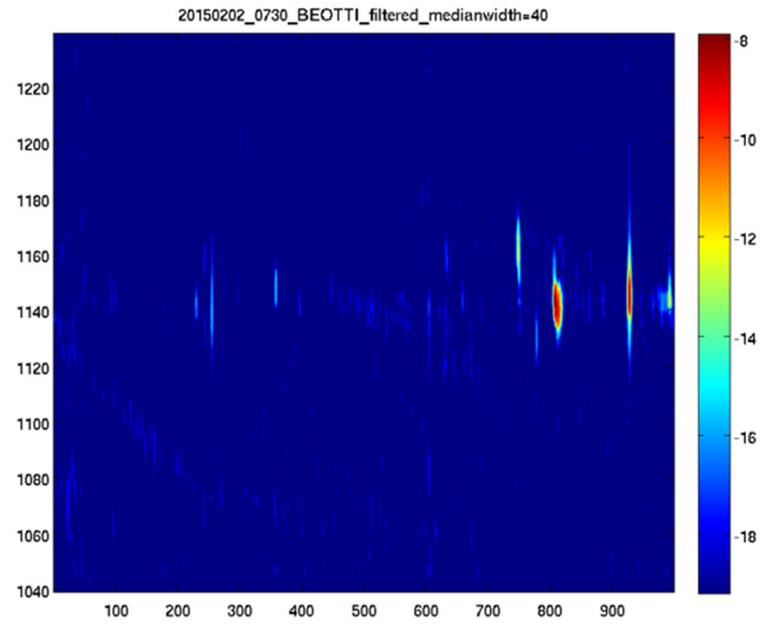


Manual count : 10

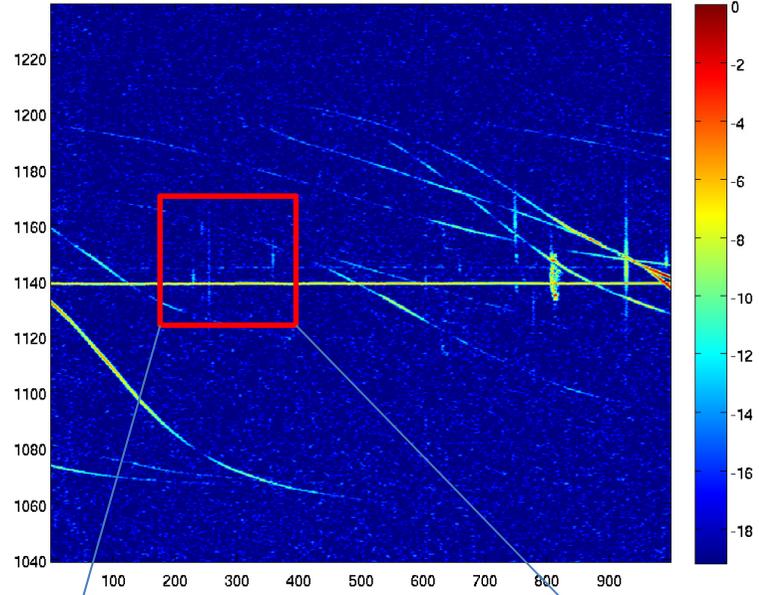


07H30

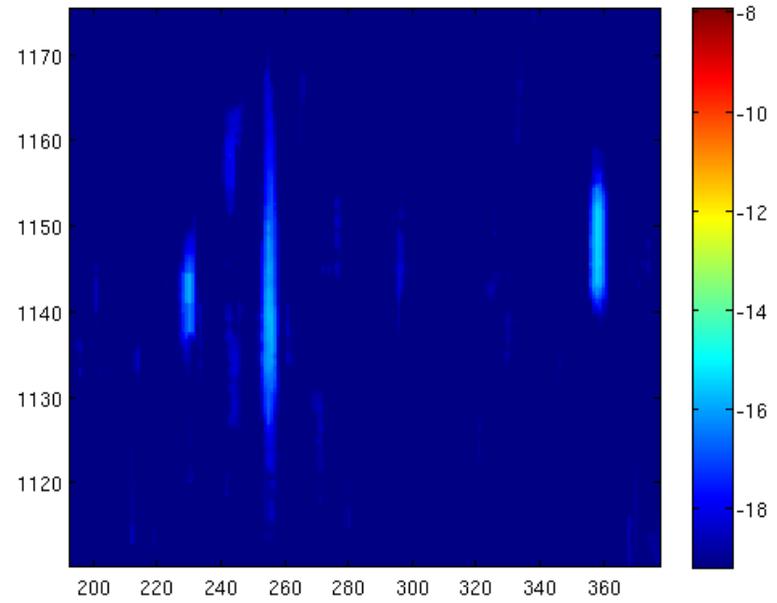




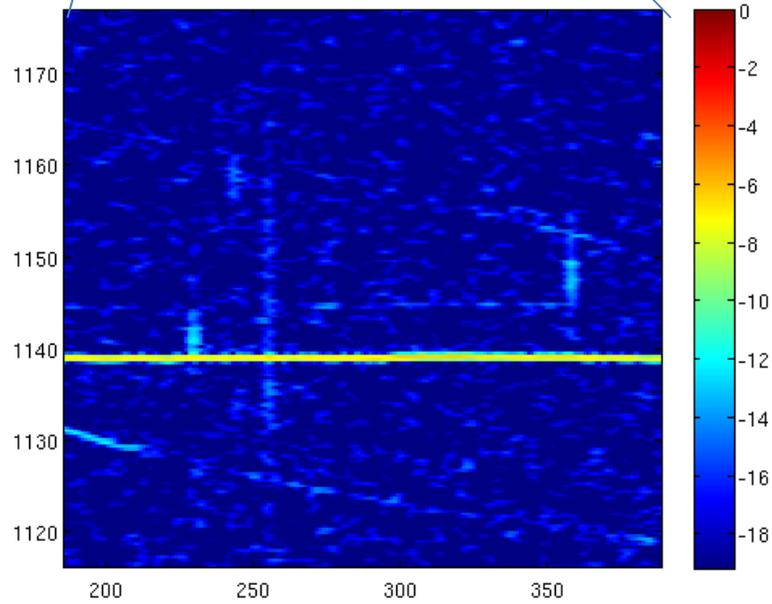
20150202\_0730\_BEOTTI: 16384-14746



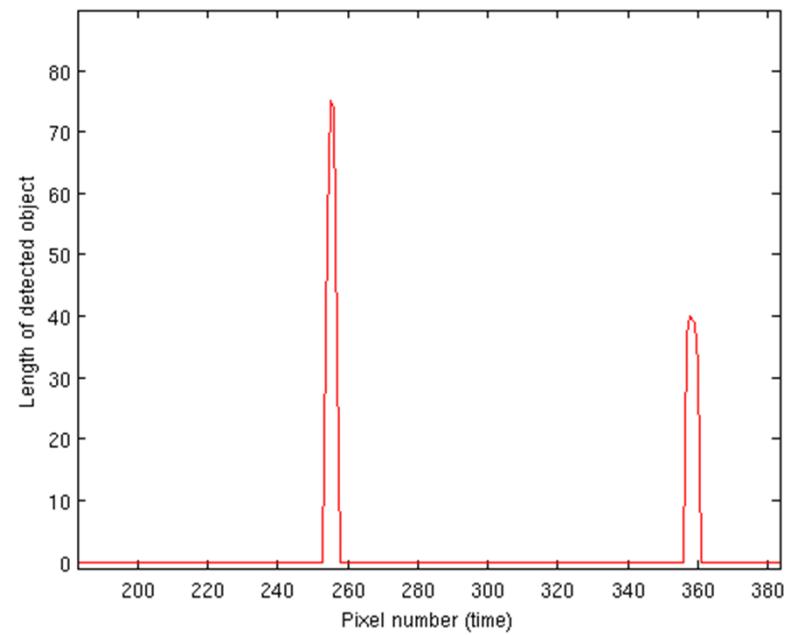
20150202\_0730\_BEOTTI\_filtered\_medianwidth=40



20150202\_0730\_BEOTTI: 16384-14746

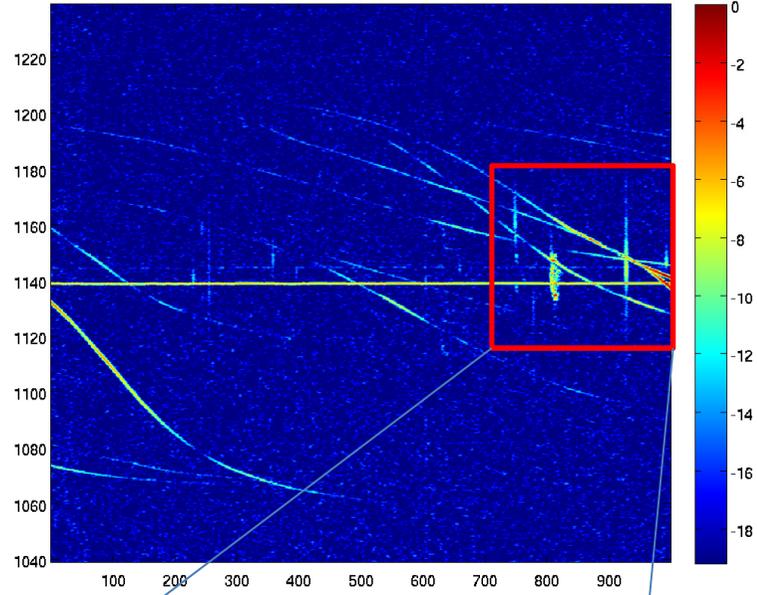


20150202\_0730\_BEOTTI\_detections

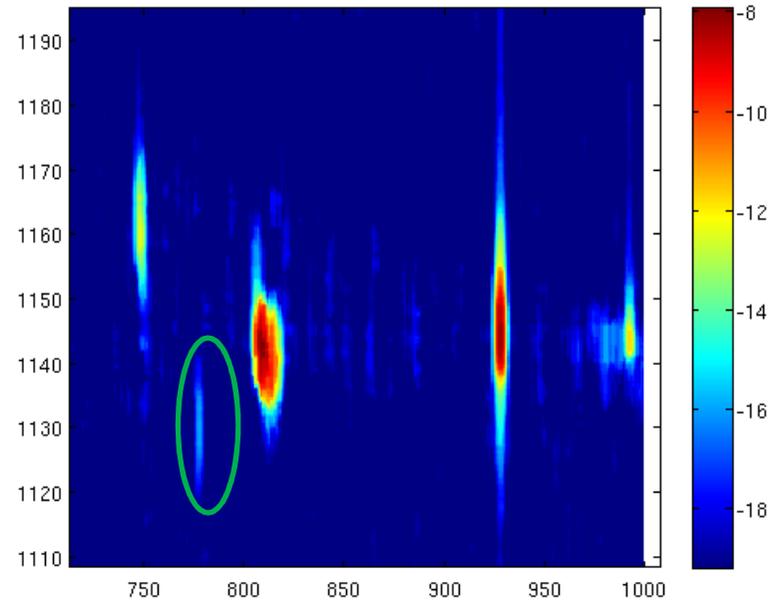


- Positive : the faint one with long extension in frequency is detected
- Negative : two meteor echoes are not detected

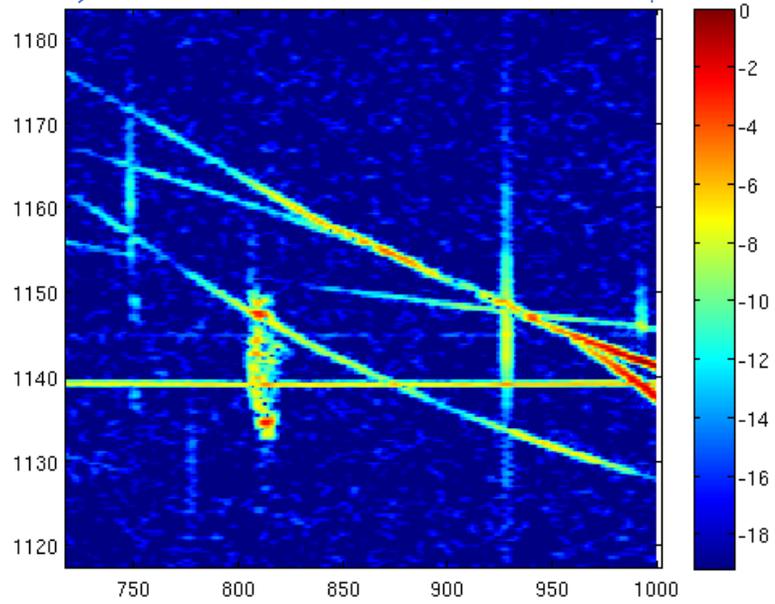
20150202\_0730\_BEOTTI: 16384-14746



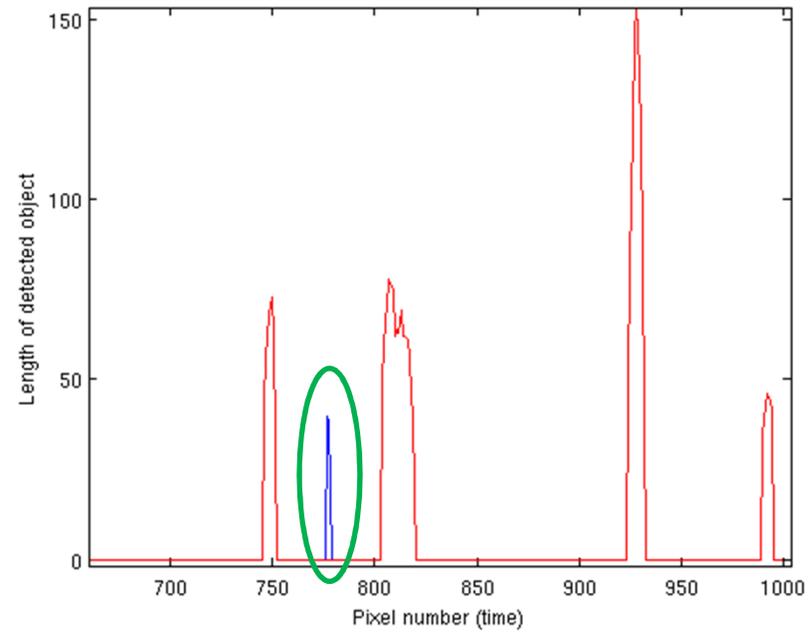
20150202\_0730\_BEOTTI\_filtered\_medianwidth=40

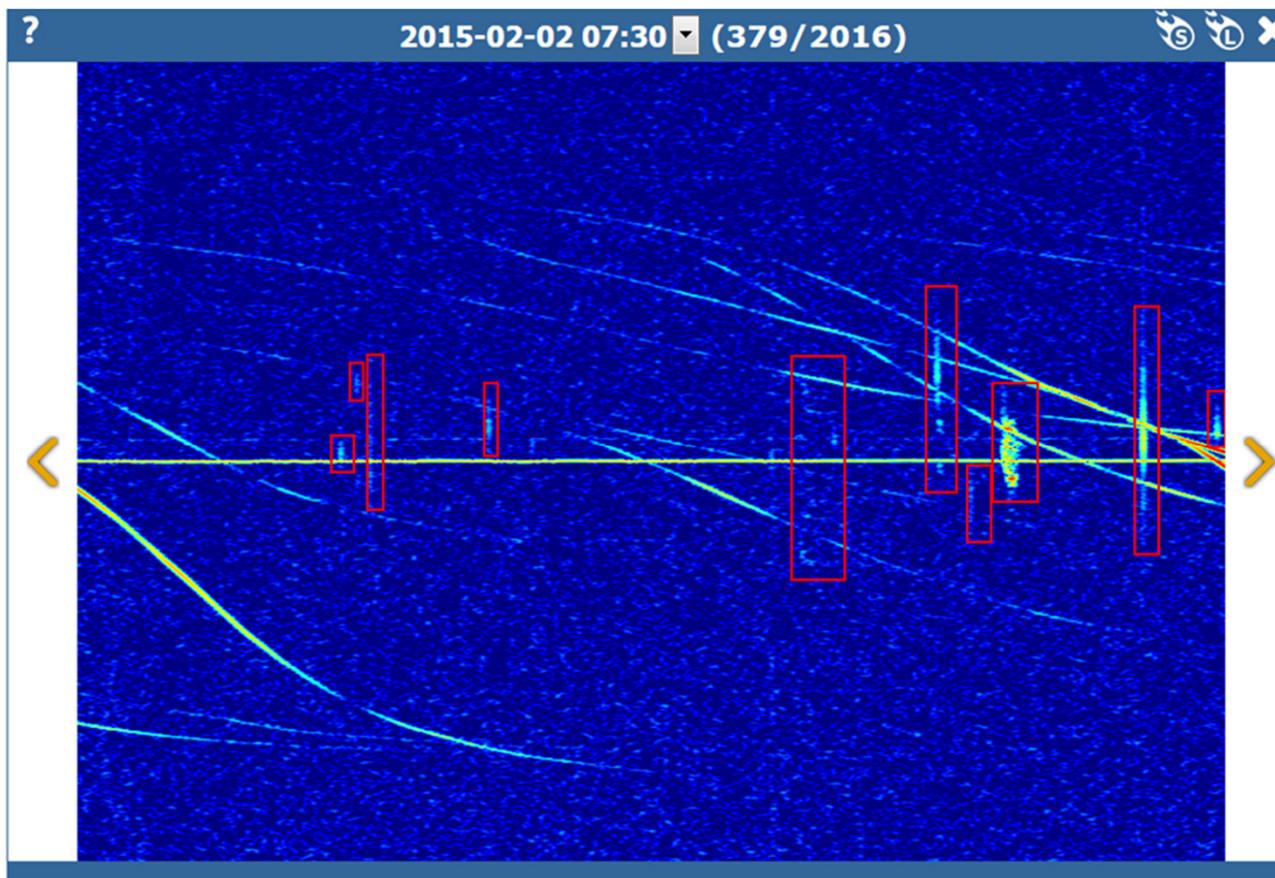


20150202\_0730\_BEOTTI: 16384-14746



20150202\_0730\_BEOTTI\_detections

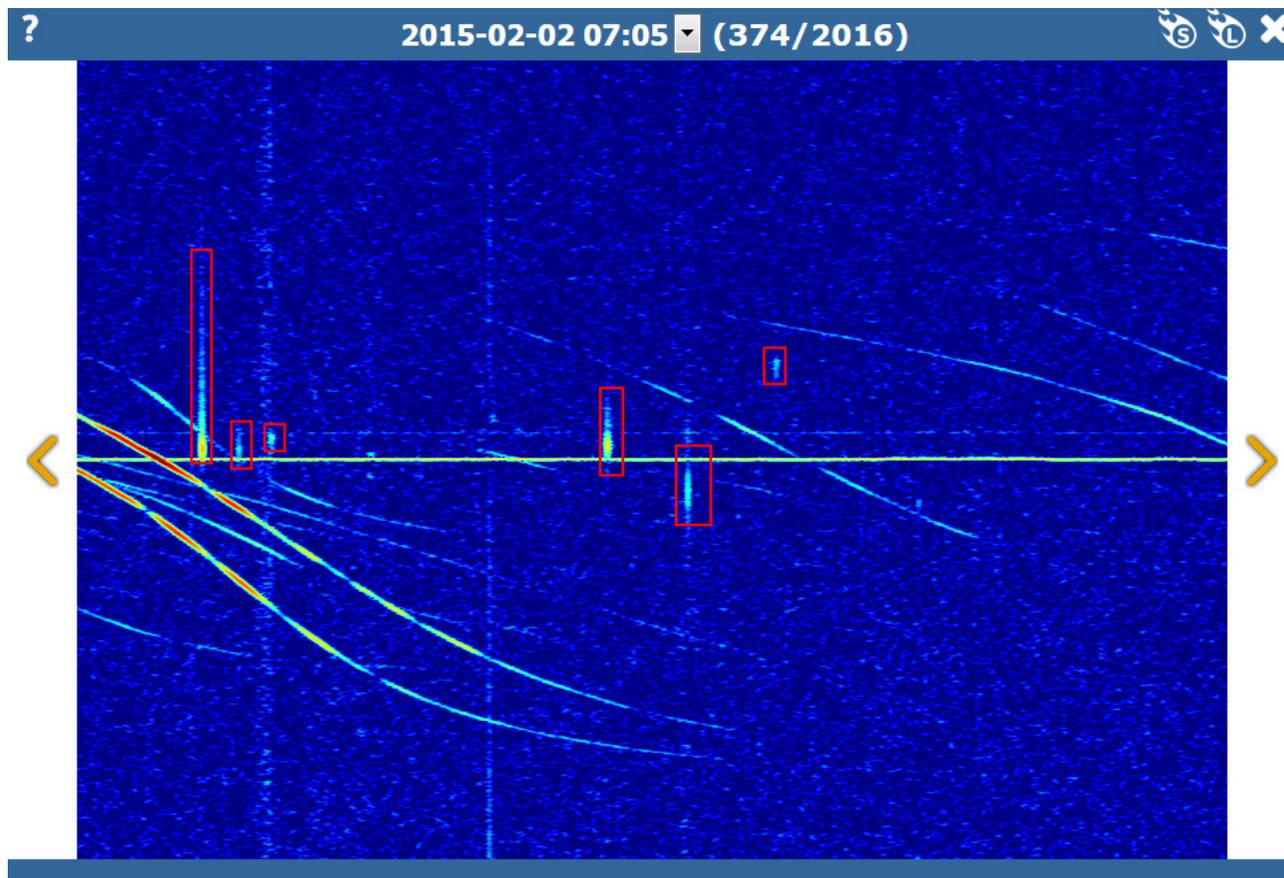




### Summary:

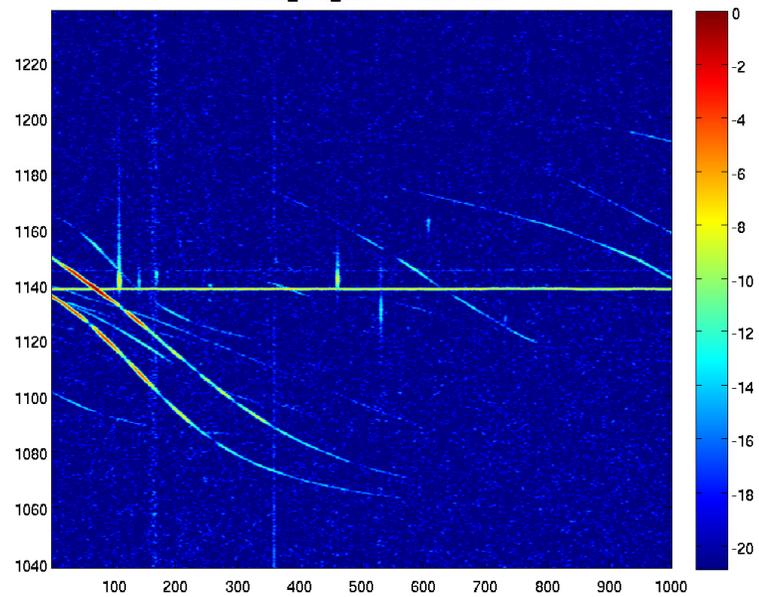
- TP : 6/10
- FP : 0
- FN : 4/10

07H05

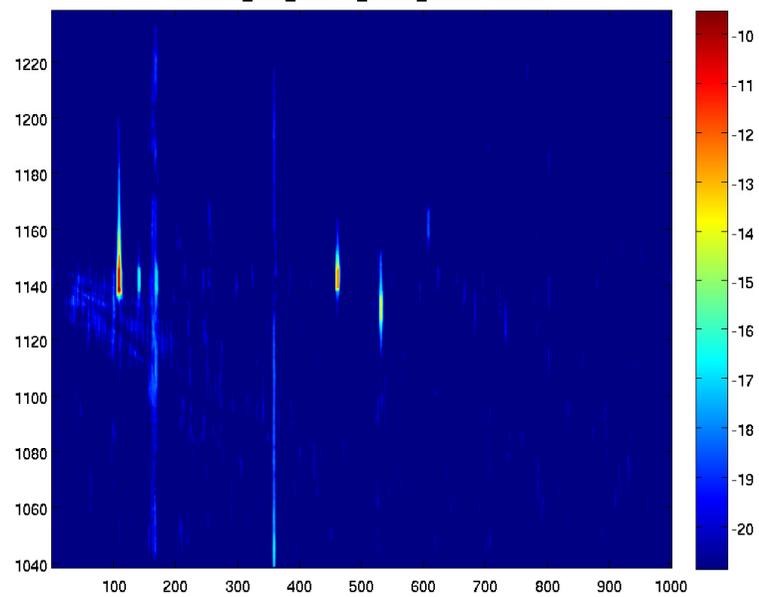


Manual count: 6

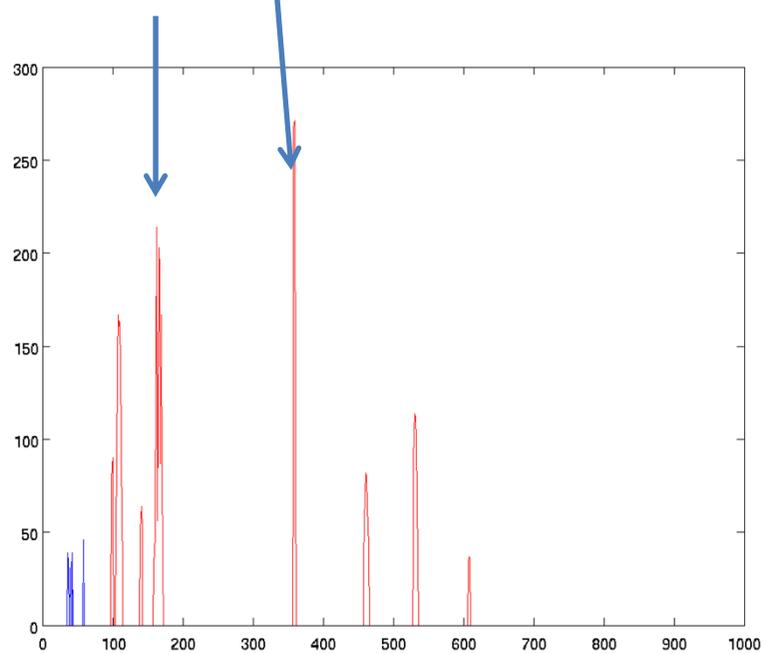
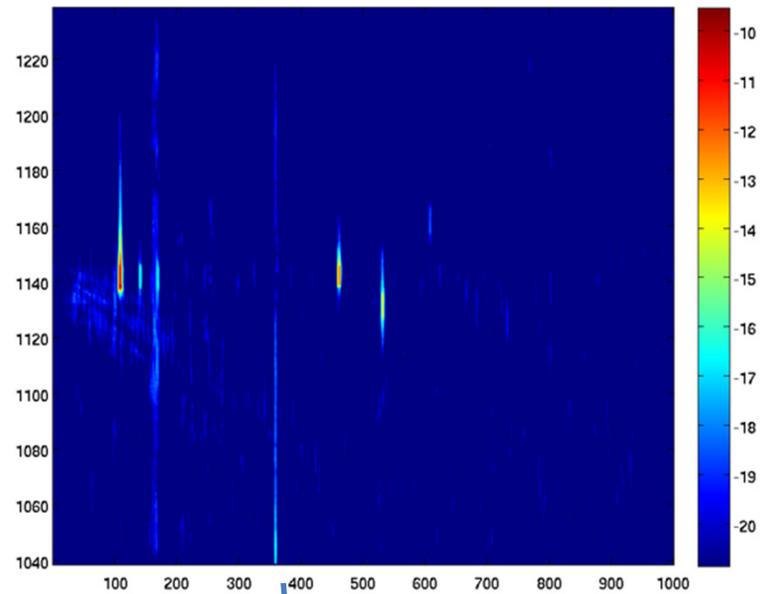
20150202\_0705\_BEOTTI: 16384-14746



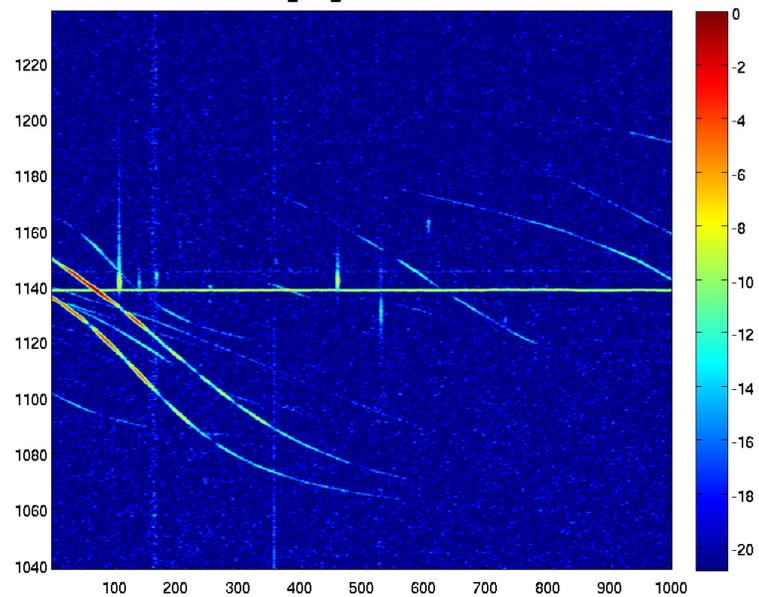
20150202\_0705\_BEOTTI\_filtered\_medianwidth=40



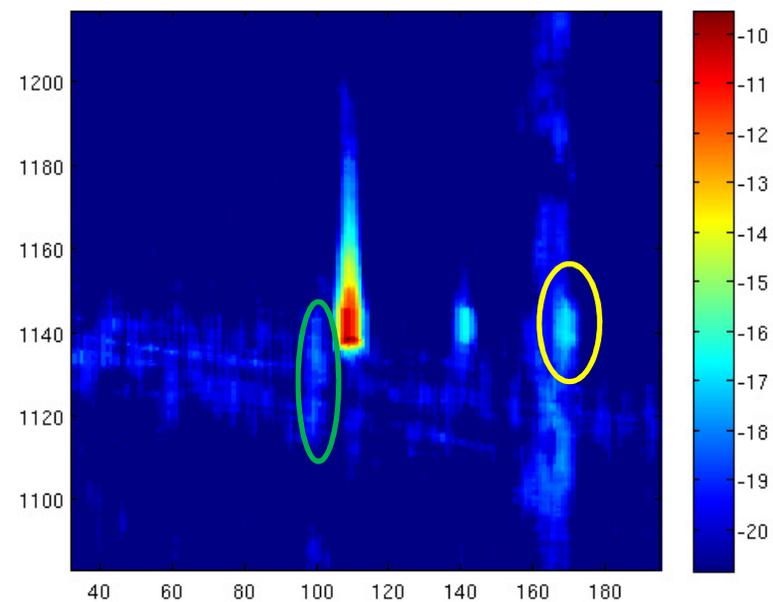
20150202\_0705\_BEOTTI\_filtered\_medianwidth=40



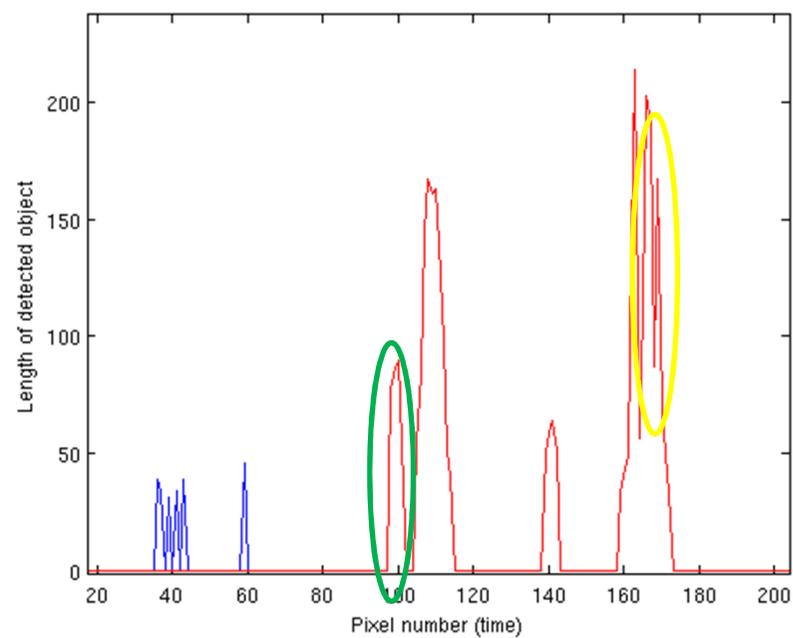
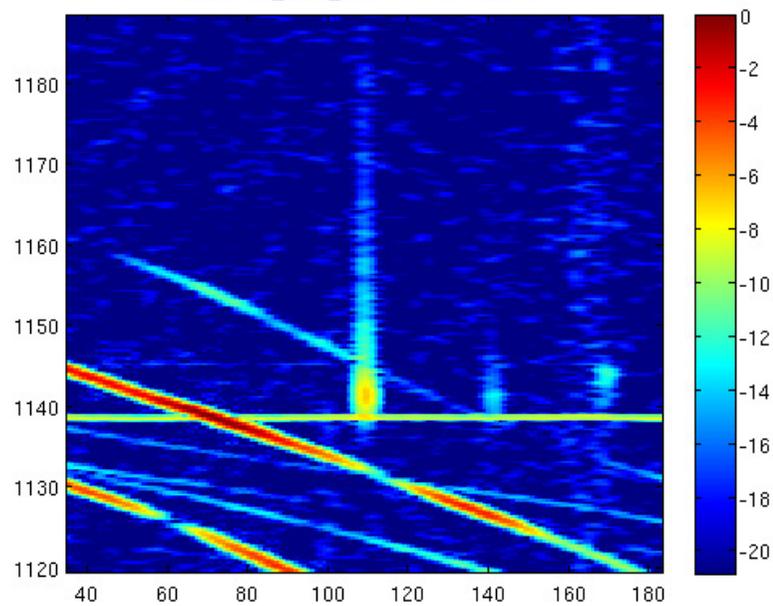
20150202\_0705\_BEOTTI: 16384-14746



20150202\_0705\_BEOTTI\_filtered\_medianwidth=40

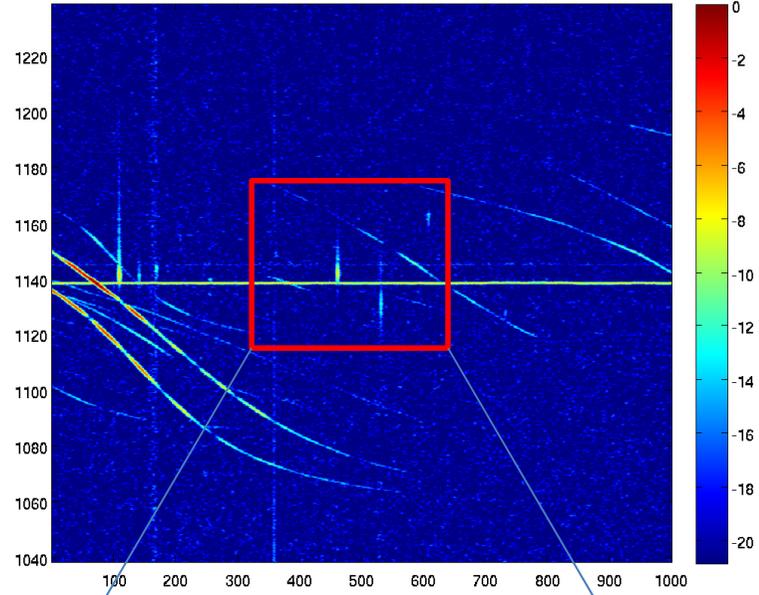


20150202\_0705\_BEOTTI: 16384-14746

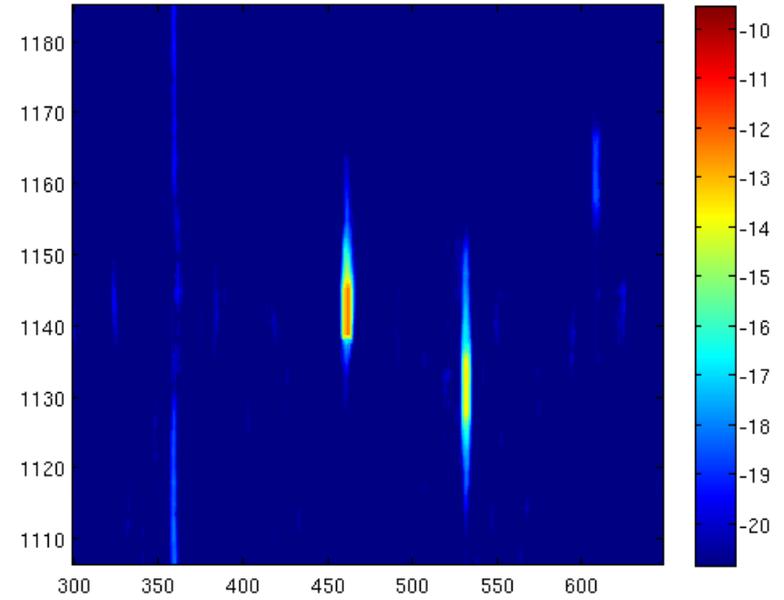


- Positive : meteor maybe detected even though it's very close to the interference?
- Negative : 1 FP ....

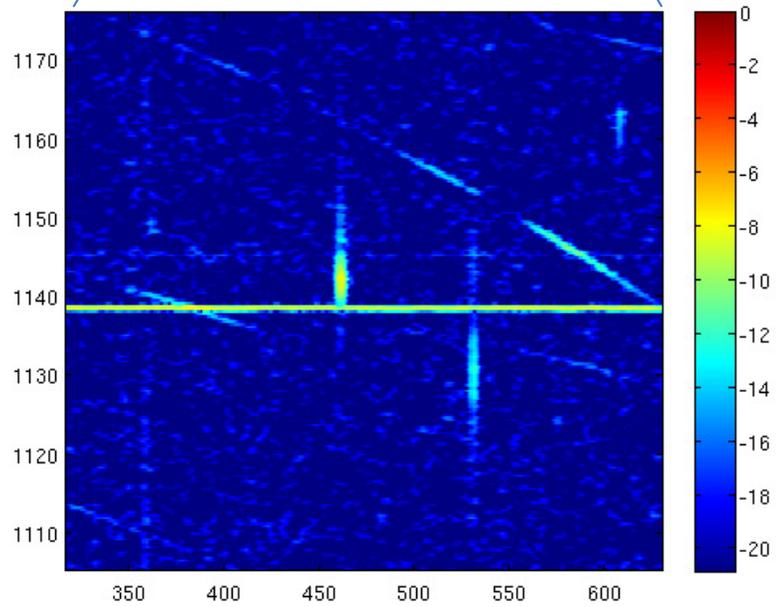
20150202\_0705\_BEOTTI: 16384-14746



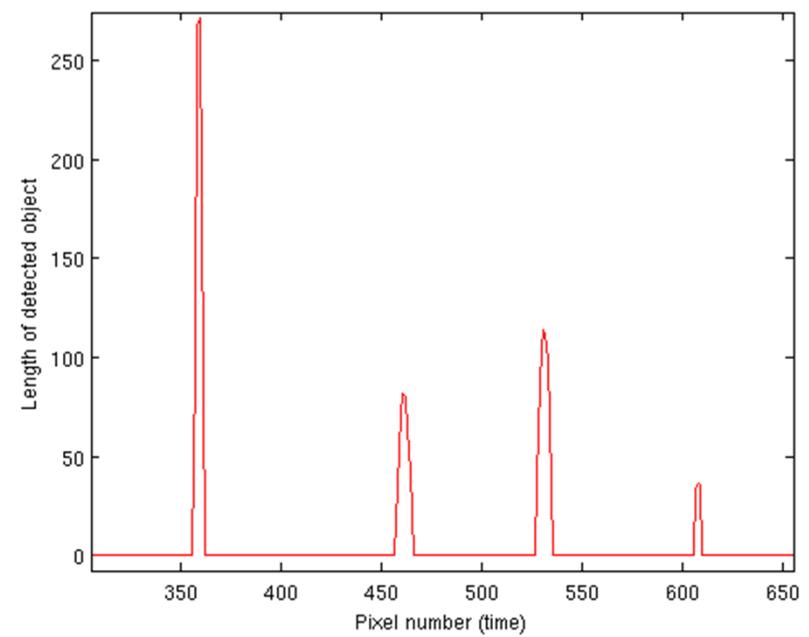
20150202\_0705\_BEOTTI\_filtered\_medianwidth=40



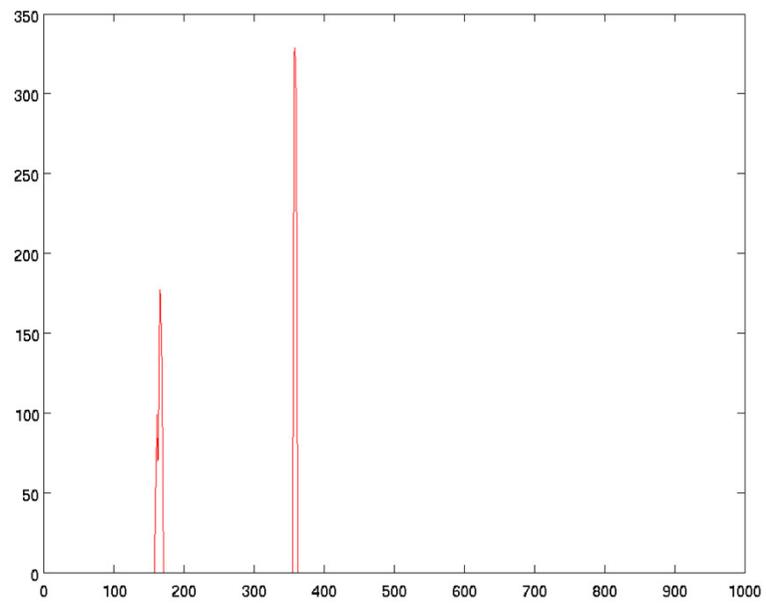
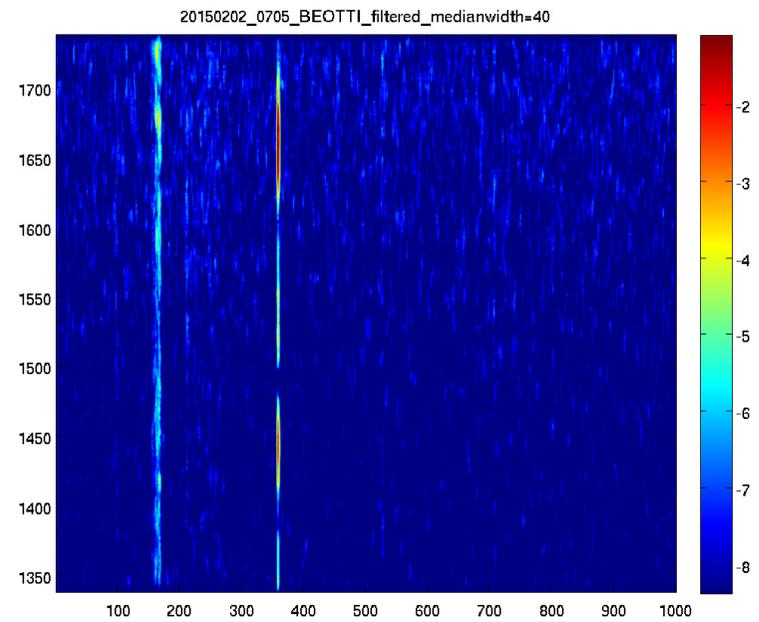
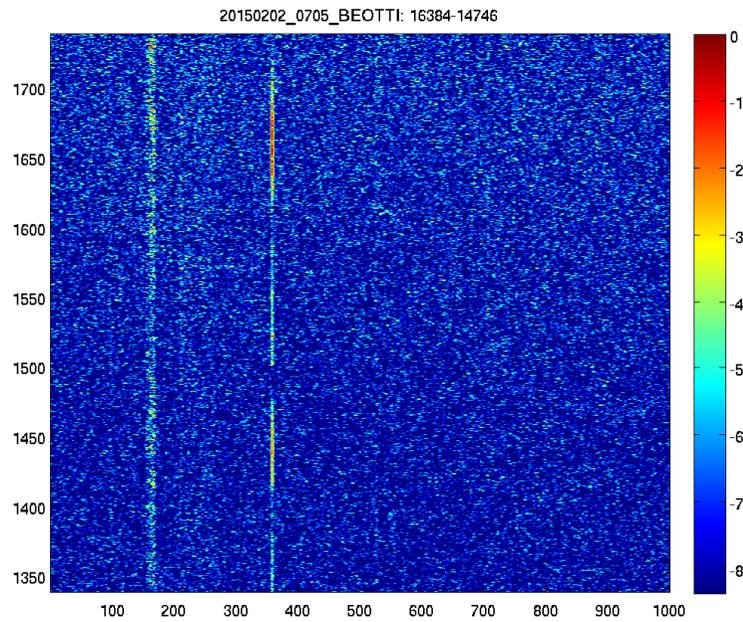
20150202\_0705\_BEOTTI: 16384-14746



20150202\_0705\_BEOTTI\_detections



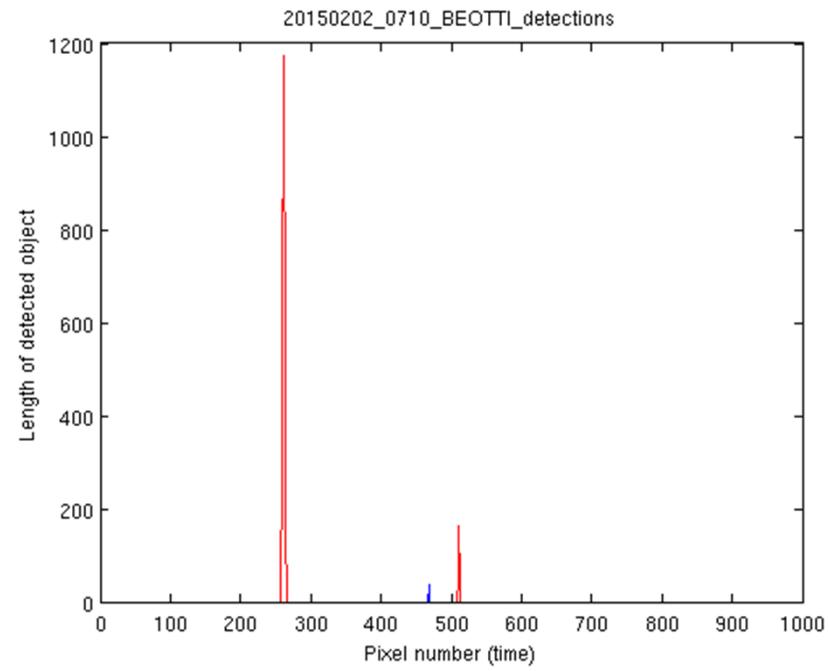
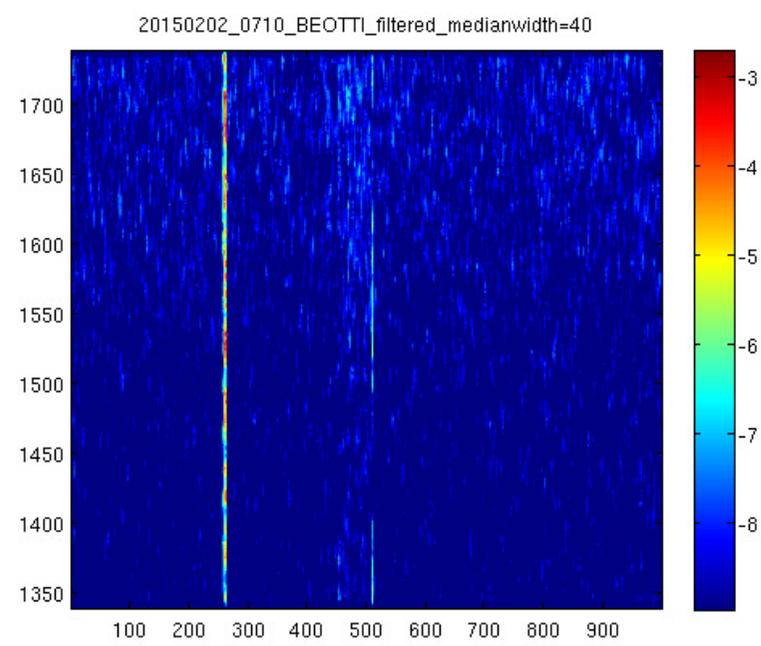
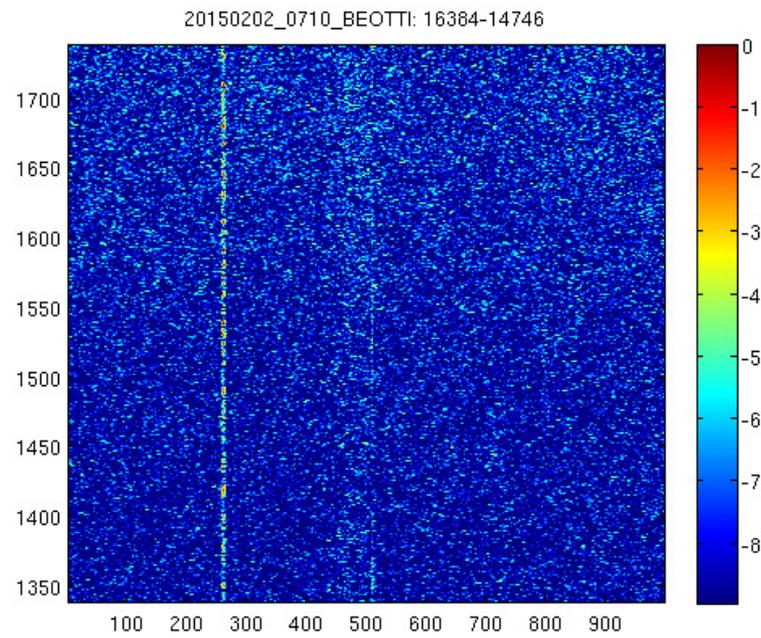
# Detection of interferences



07H05

Tests with threshold3

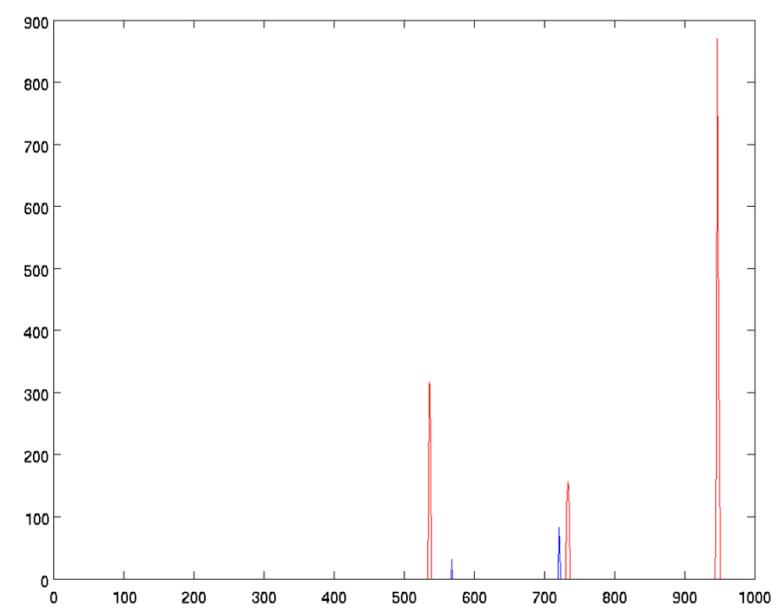
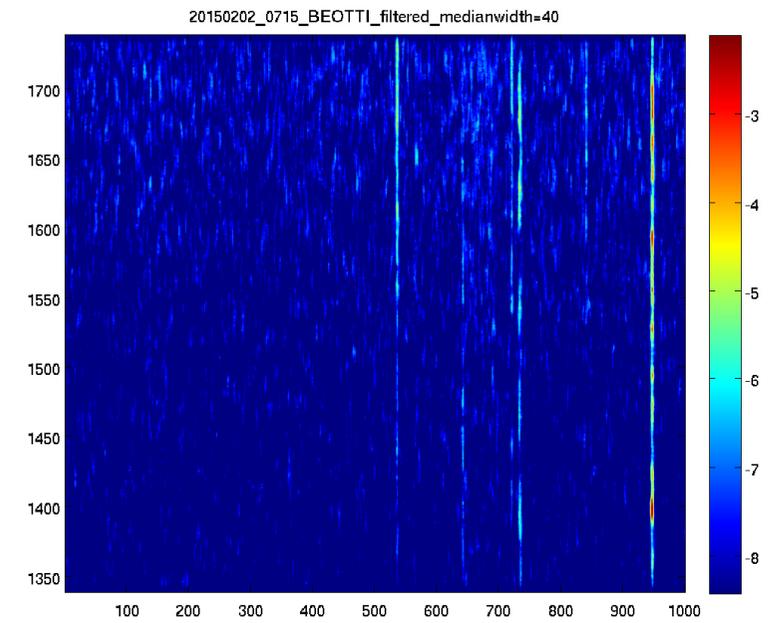
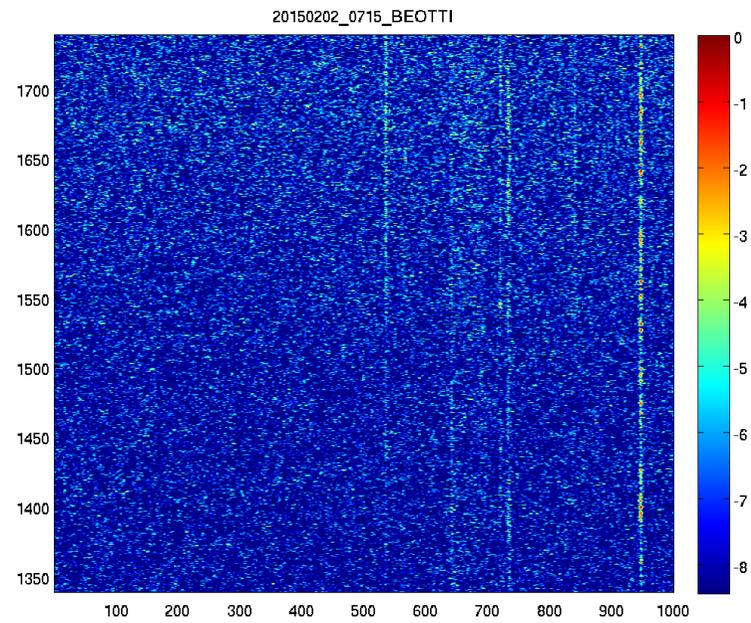
Works well



07H10

Tests with threshold3

Works well



07H15

Tests with threshold3

Works well

# New algorithm

- Work by Maxence Draguet (ULB)
- Makes it automatic, comparison with manual database, computes TP, FP rates, remove interferences
- Threshold varies from column to column

$\text{Threshold} = \text{median}(\text{spect\_filtered}) + \text{nb\_MAD} * \text{MAD}(\text{spect\_filtered})$

- « Optimization » of 4 parameters : median\_width, nb\_MAD, length\_min\_filteredmeteor, width\_min\_filteredmeteor = [ 40, 25, 4, 5 ]

# Test for BEUCCL 01-02/01/2016

01/01/2016

- TP ~ 65 %
- FP ~ 10 %

02/01/2016

- TP ~ 68 %
- FP ~ 14 %

