

Analyse Observations PAON4 - ScanA Aug 2018

Reza - 28 Août 2018

1. Description de l'analyse

2. Sources brillantes :

➡ CasA (A04,A16) , CygA (A20)

3. Sources moins brillantes:

➡ 3C380 (A10), 3C295 (A05-A06) , NGC1275/Pers.A (A19)

4. Conclusions préliminaires

- Observations PAON4 (ScanA) de Juillet-Août 2018
- Observations/gestion des acquisitions par Claude
- Réduction des données (cartes TFM, corrections de gain $g(\nu)$, $G(t)$ et phases) par Olivier
- Détermination de phases instrumentale par ajustement des franges CasA par Jean-Eric sur le transit CasA du 17 Juillet (A00)
- Analyse du 25-28/08, à partir des calibrations d'Olivier ~24 Août -
- Comparaison signaux observés et attendus à 1395 MHz (synchrotron et radio-sources) et 1420 MHz (HI Galactique + radio-sources)
- Signaux attendus calculés par map2vis à 2 fréquences, à partir d'une carte synchrotron+sources NVSS > 1 Jy (1395 MHz) et carte LAB + sources NVSS > 1 Jy (1420 MHz)
- **L'analyse des observations ne comprend aucun filtrage/nettoyage ni en temps, ni en fréquence**
- Les observations des voies H sont simplement moyennées sur une bande de 10 MHz autour de 1395 MHz et une bande de 1.2 MHz autour de 1420.4 MHz

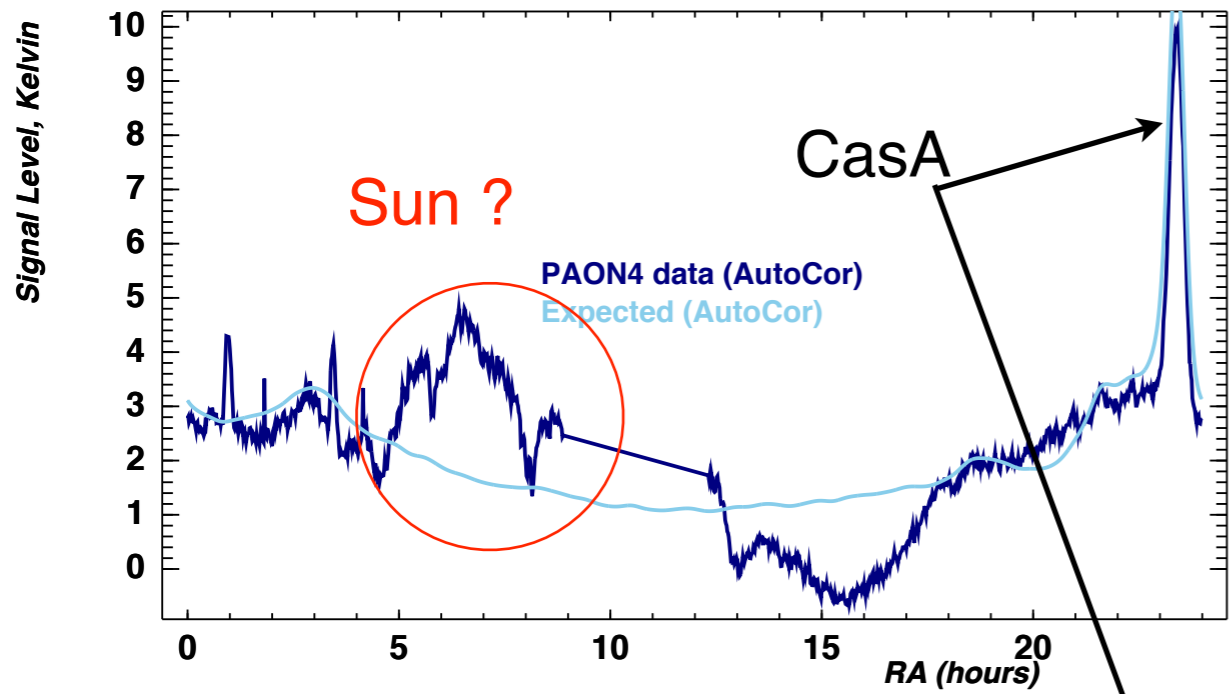
- Le signal d'autocorrélation (AC) correspond simplement à la moyenne des autocorrélations des 4 voies H
- Après correction de gain dépendant du temps/température par Olivier, les signaux d'autocorrélation sont autour de l'unité
- Un facteur de conversion en température ~ 110 a été déterminé à l'oeil en comparant le signal AC observé et attendu à 1420 MHz, ainsi qu'un niveau de bruit ~ 0.98 , correspondant donc à $T_{\text{sys}} \sim 107$ K
- Les signaux des 6 cross-corrélations (CX) H-H ont simplement été multipliés par le facteur de conversion 110
- $AC \rightarrow (AC - 0.98) \times 110$ en Kelvin ; $CX \rightarrow CX \times 110$ en Kelvin
- J'ai calculé les signaux attendus à 1420 MHz en sommant les cartes LAB sur une largeur de bande ~ 1.2 MHz, alors que les structures HI varient violemment sur ces bandes de ~ 1.2 MHz
- On s'attend donc à des différences relativement importantes entre signaux observés et ceux calculés en supposant que toute l'émission se fait à la fréquence centrale de 1420.4 MHz

Sources brillantes

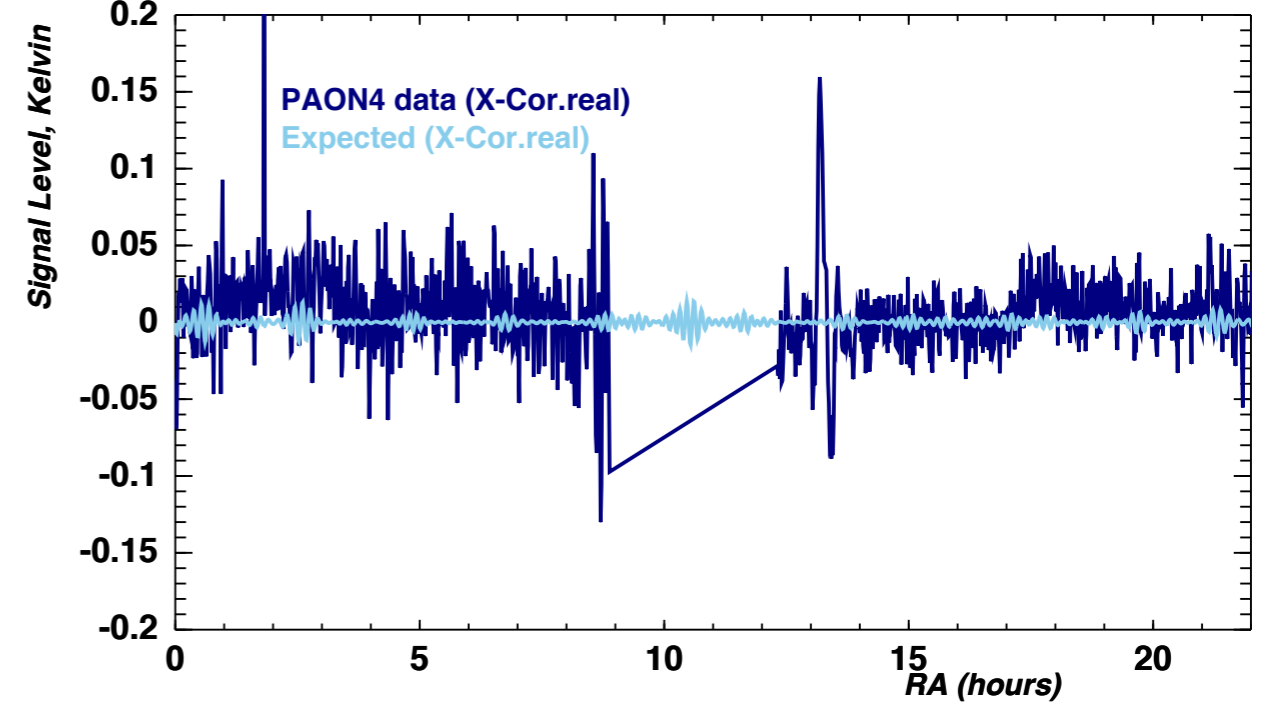
CasA ($\alpha=23\text{h}23.5$, $\delta=58\text{d}48'$) : **A04** **A16**

Scan A04 du 21/07 Elev=11.4 - Declinaison de CasA

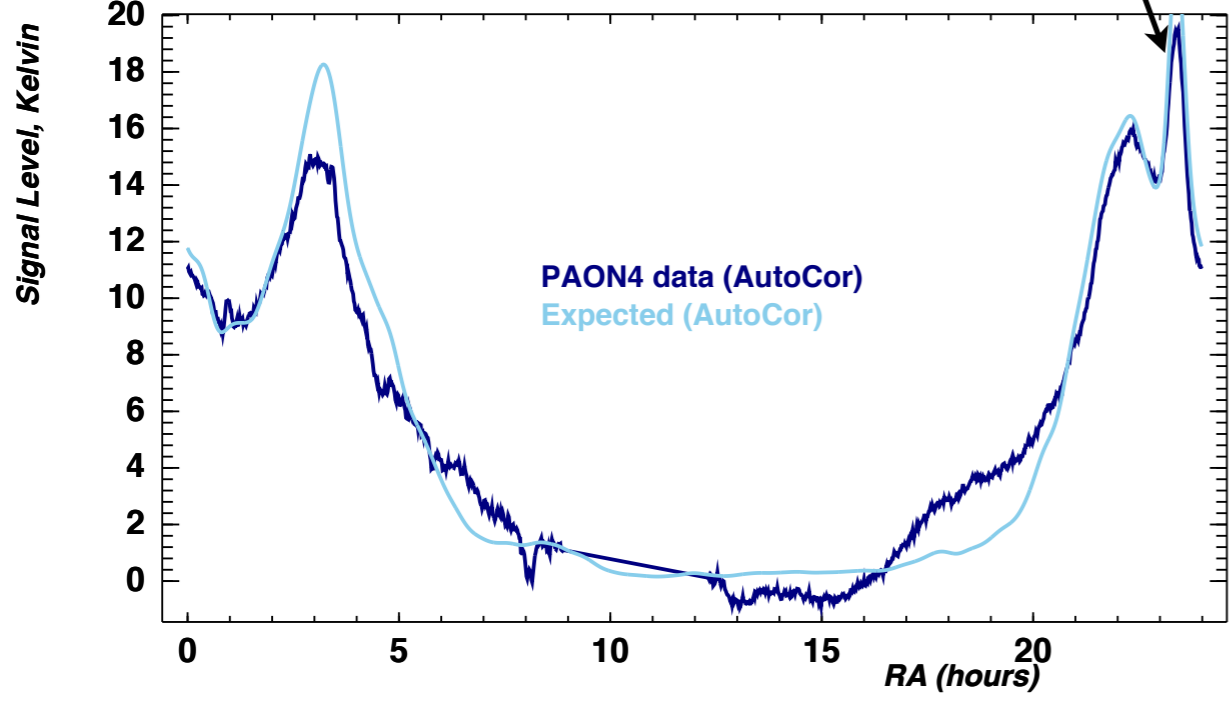
PAON4 A04 (elev=11.4) and expected AutoCor @ 1390 MHz



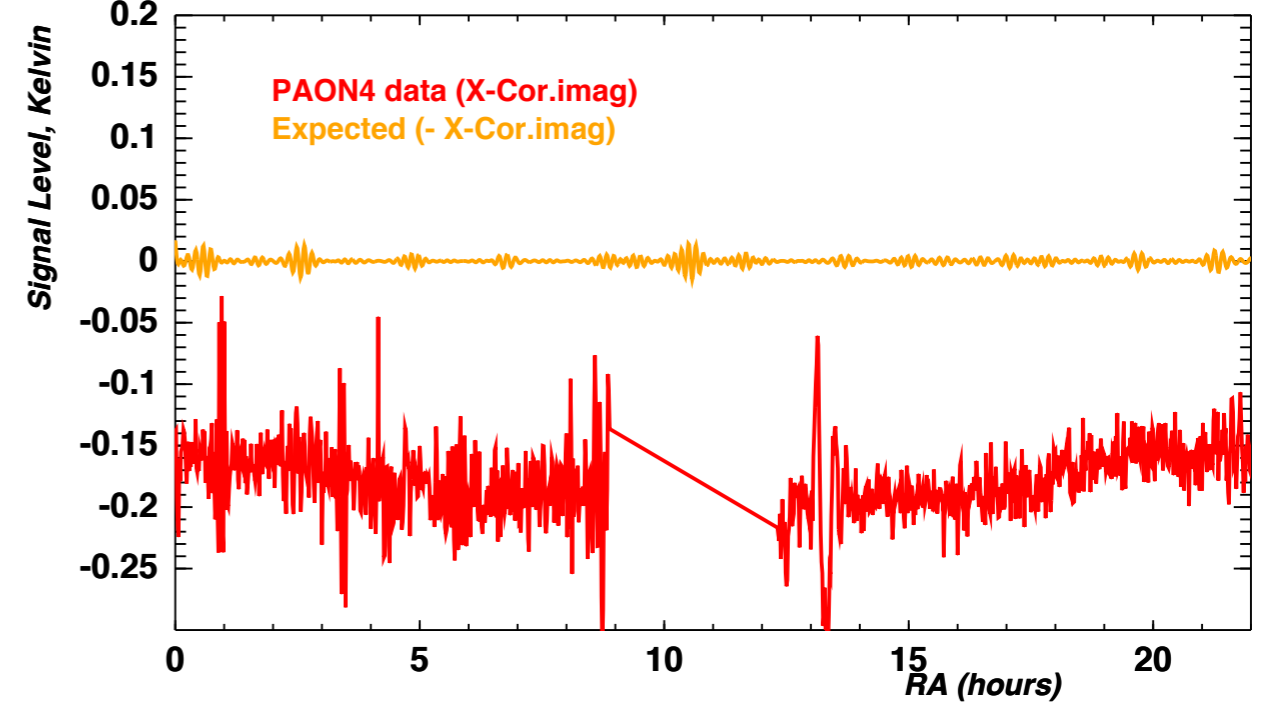
PAON4 A04 (elev=11.4) and expected 2H4H @ 1390 MHz



PAON4 A04 (elev=11.4) and expected AutoCor @ 1420 MHz



PAON4 A04 (elev=11.4) and expected 2H4H @ 1390 MHz

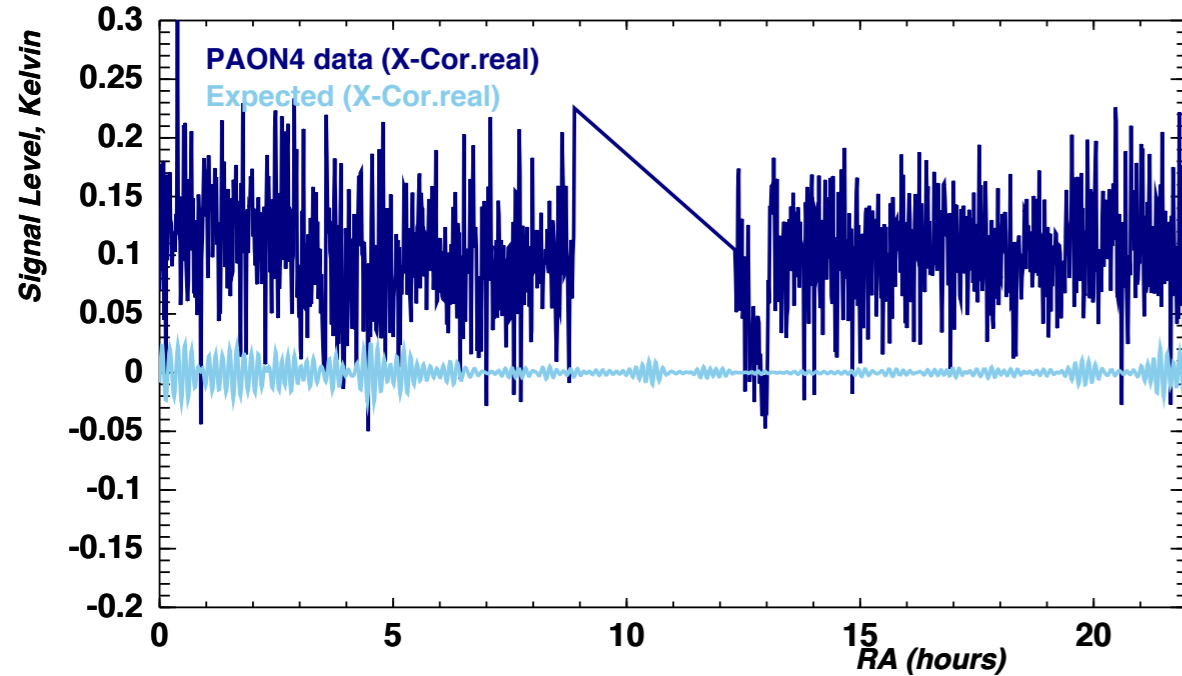


Auto-corrélation

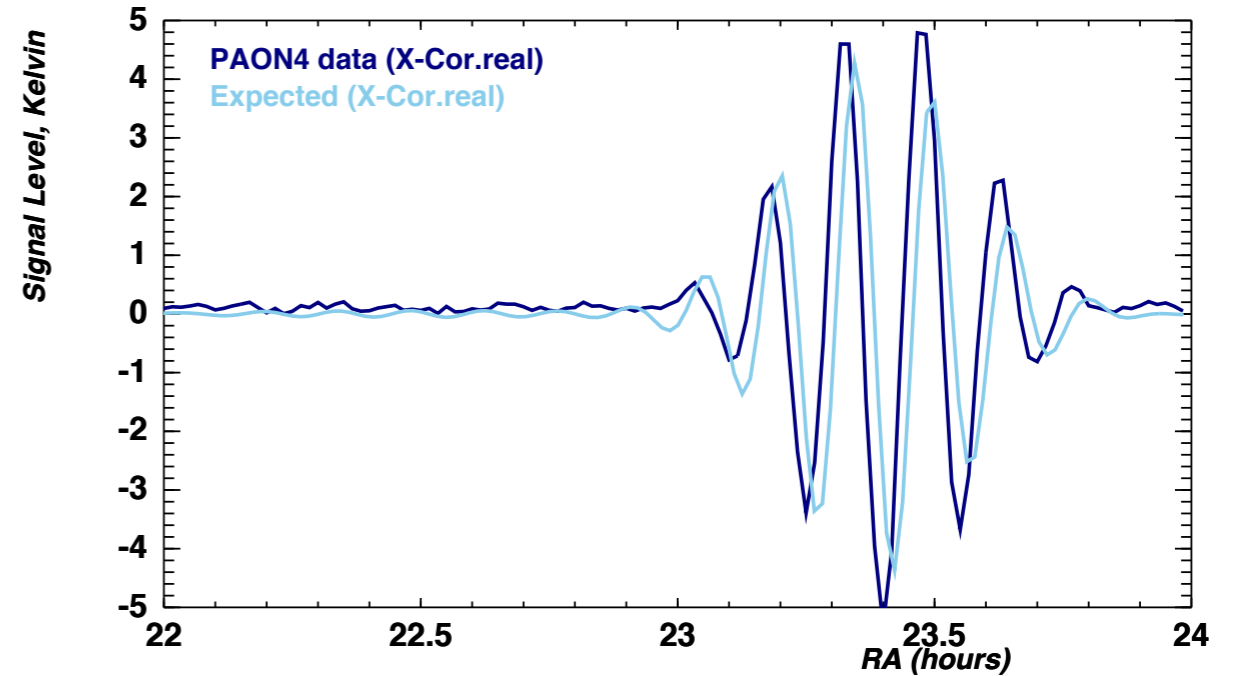
Cross-Corr (real/imag) en dehors du transit CasA

Scan A04 du 21/07 Elev=11.4 - Declinaison de CasA

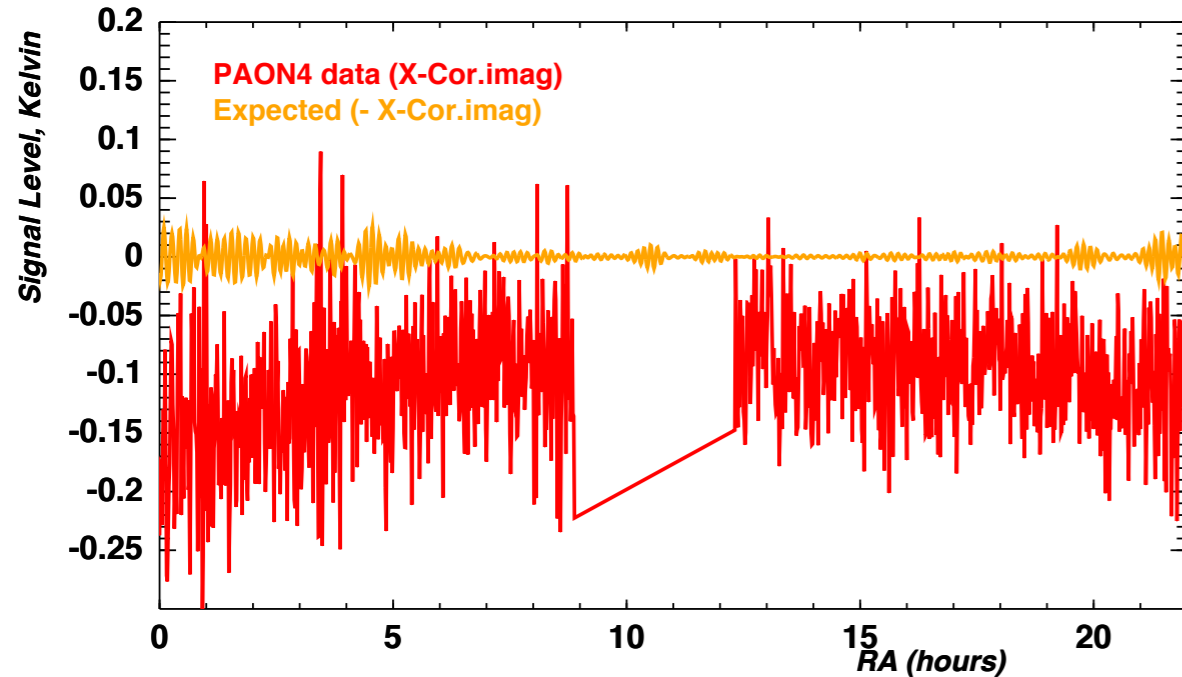
PAON4 A04 (elev=11.4) and expected 2H4H @ 1420 MHz



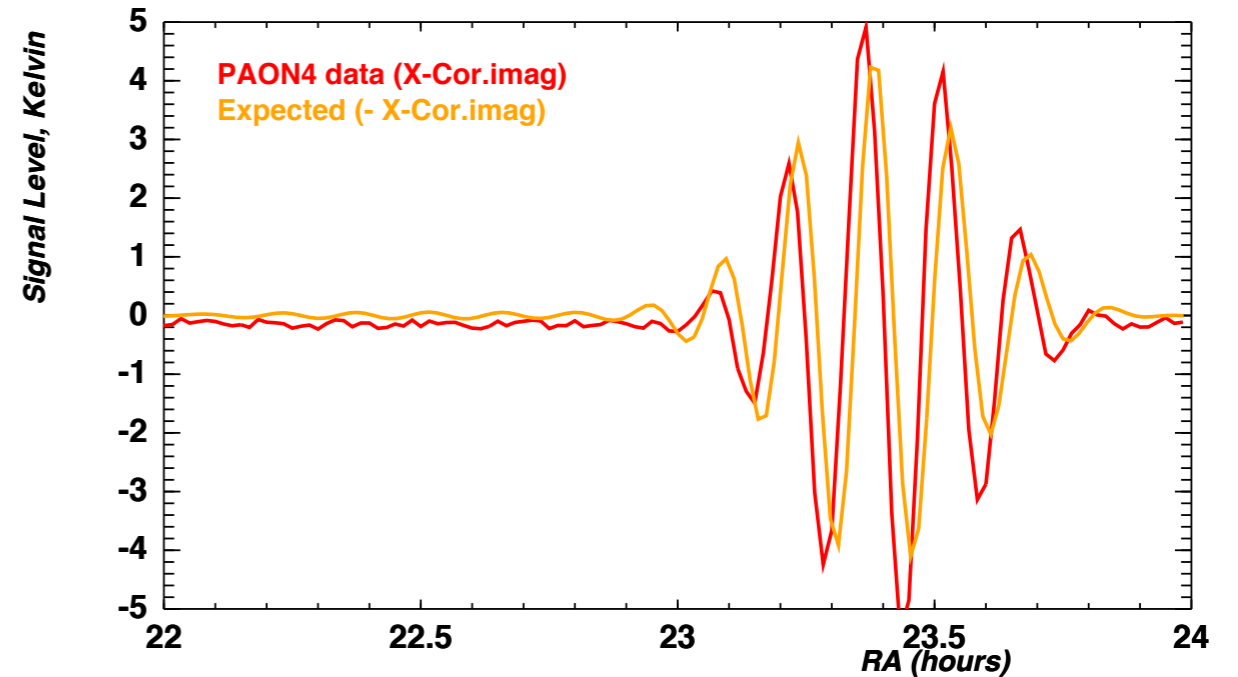
PAON4 A04 (elev=11.4) and expected 2H4H @ 1420 MHz



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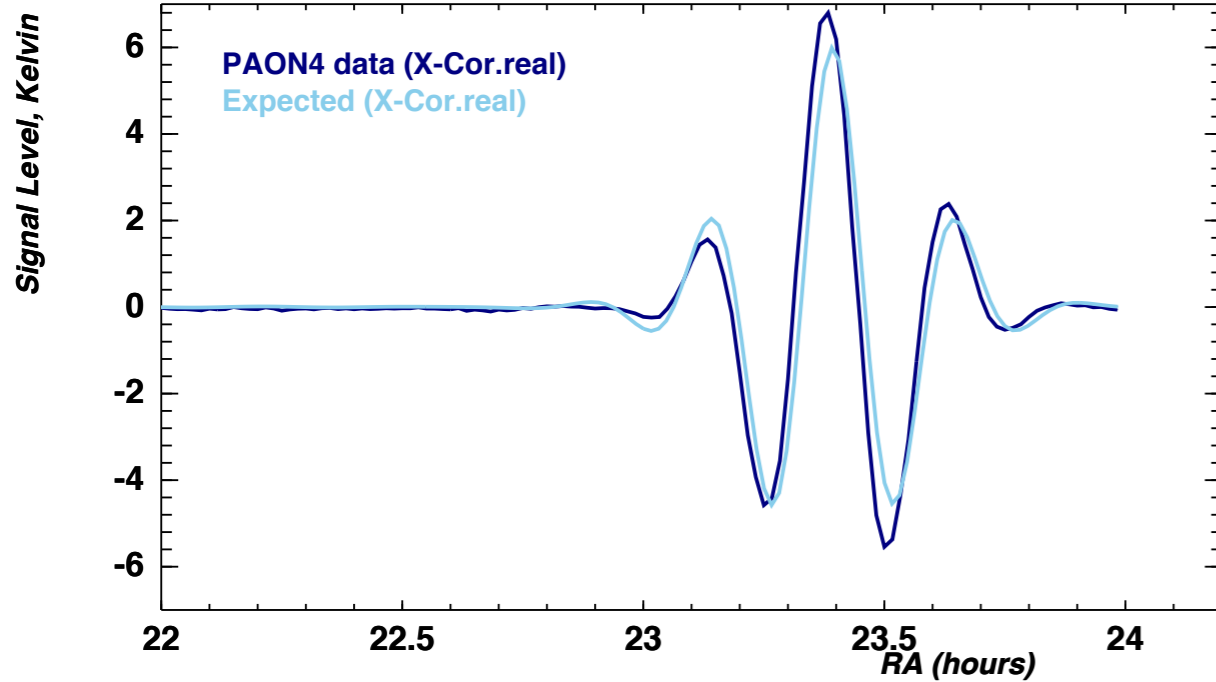


Cross-Corr 2H4H (**real/imag**) en dehors du transit CasA (gauche) et transit CasA (droite)

Scan A04 / Elev=11.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

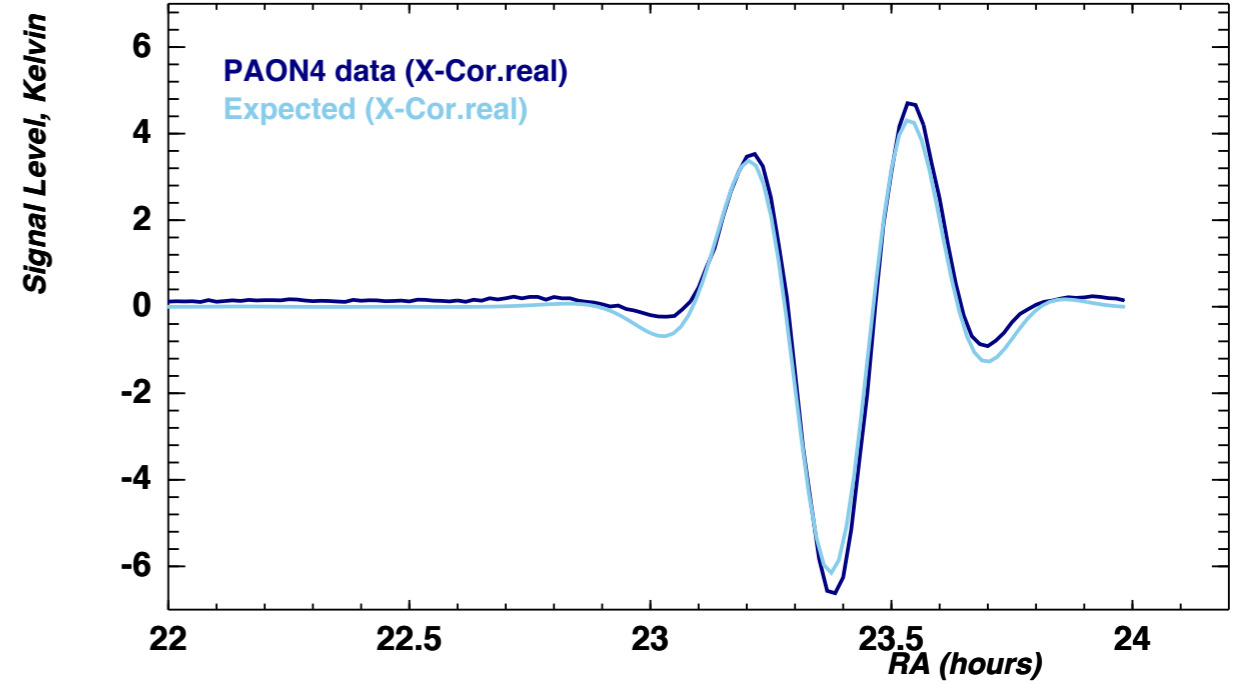
IH2H

PAON4 A04 (elev=11.4) and expected IH2H @ 1390 MHz

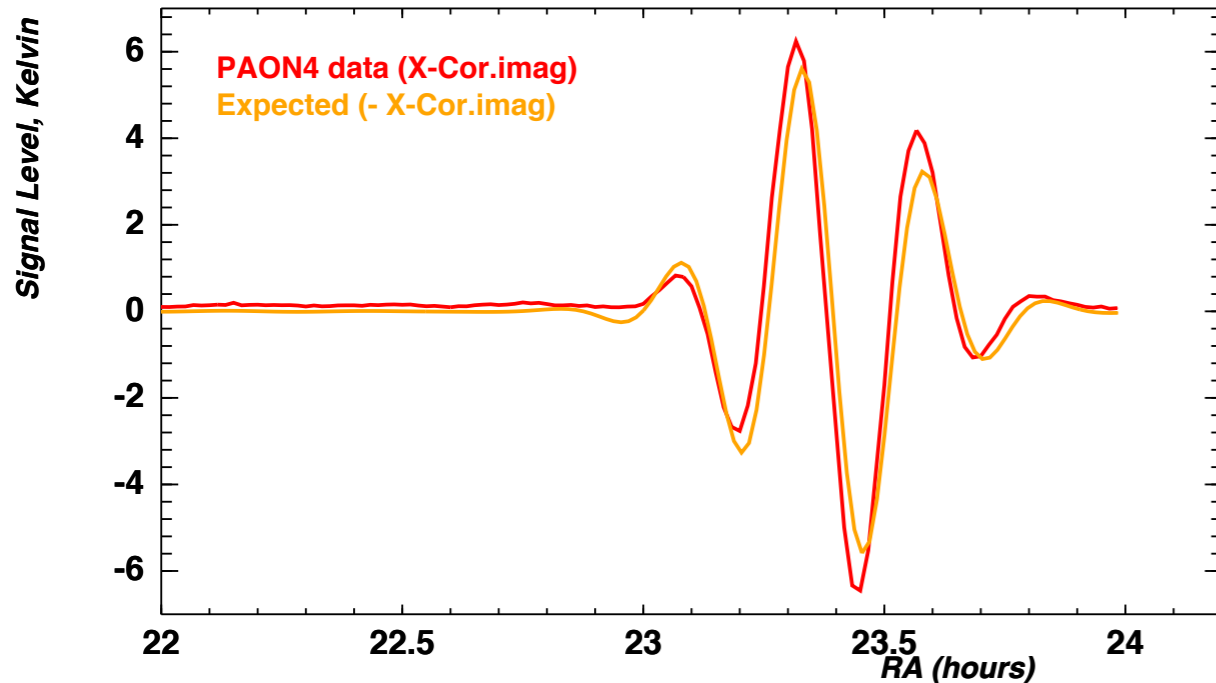


IH3H

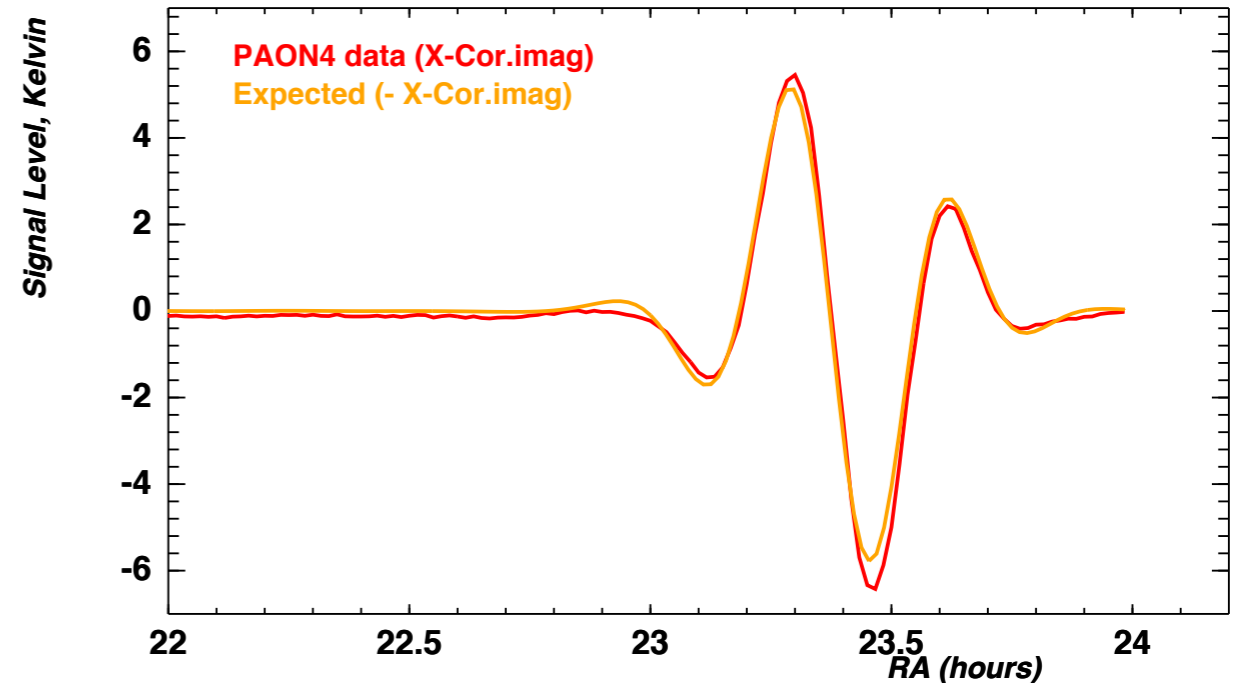
PAON4 A04 (elev=11.4) and expected IH3H @ 1390 MHz



PAON4 A04 (elev=11.4) and expected IH2H @ 1390 MHz



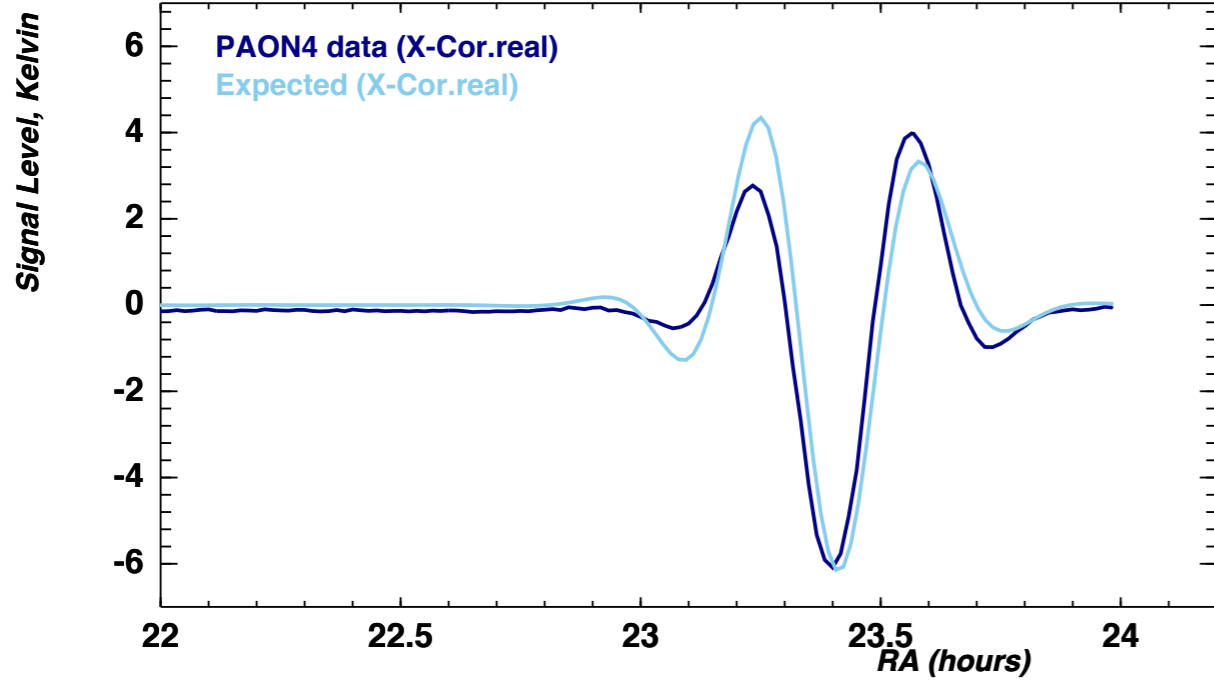
PAON4 A04 (elev=11.4) and expected IH3H @ 1390 MHz



Scan A04 / Elev=11.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

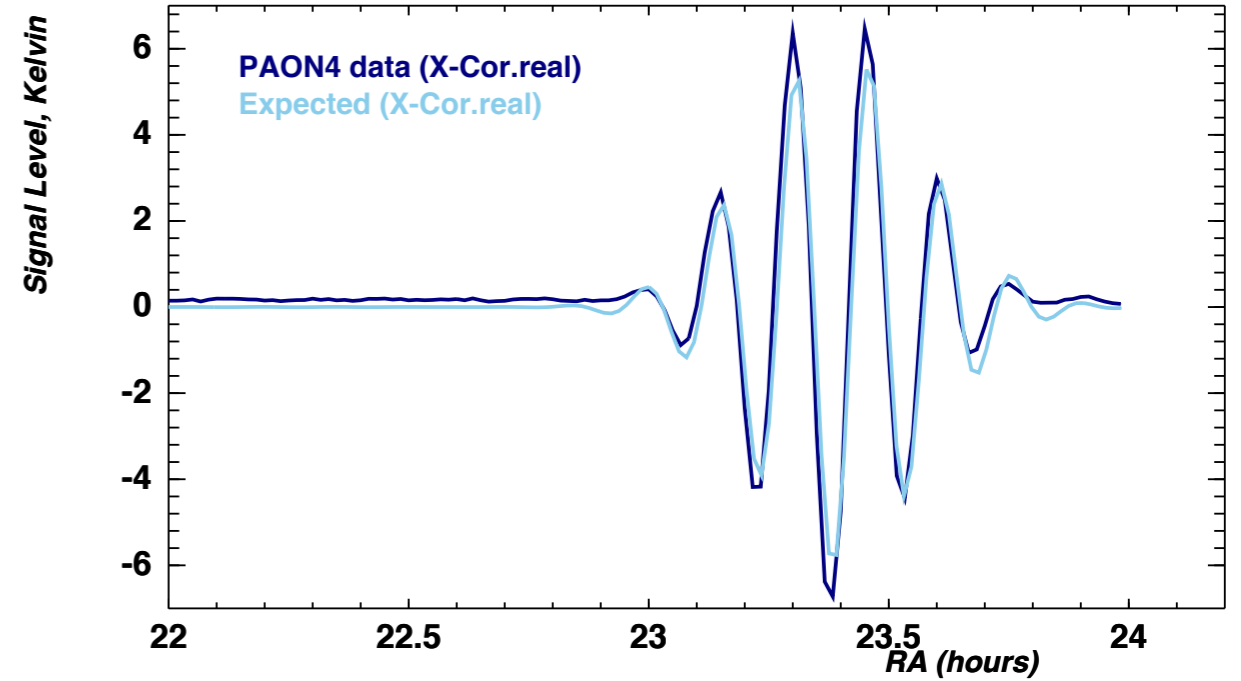
1H4H

PAON4 A04 (elev=11.4) and expected 1H4H @ 1390 MHz

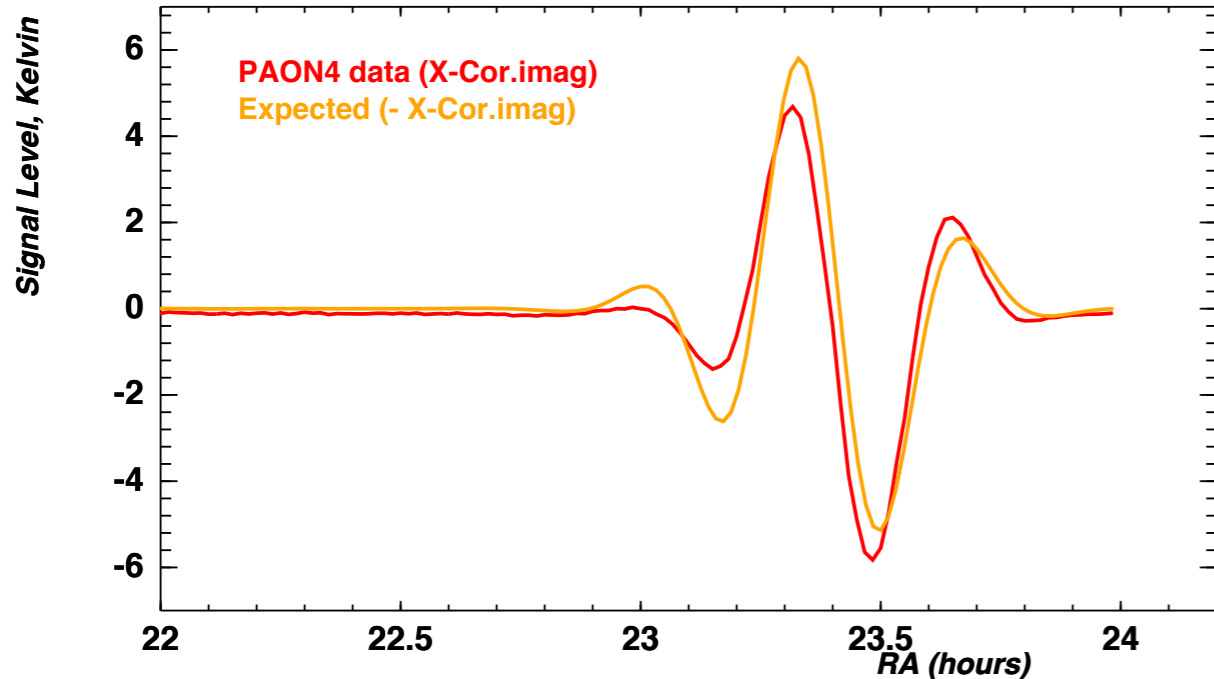


2H3H

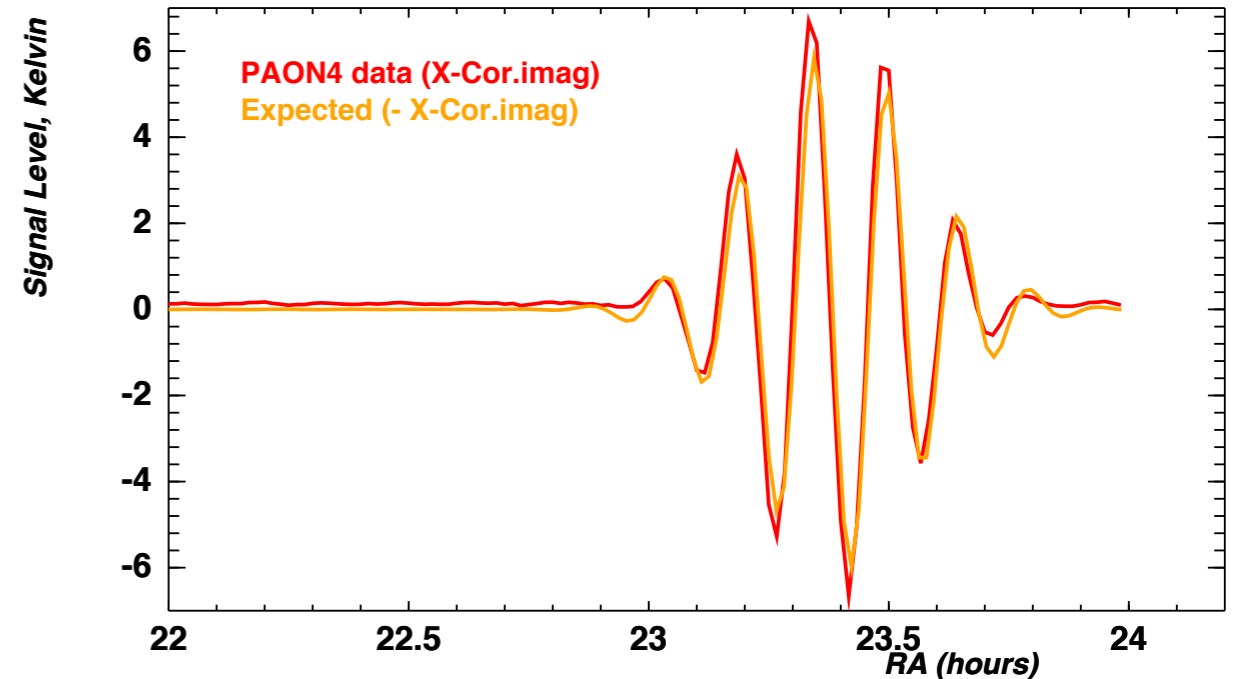
PAON4 A04 (elev=11.4) and expected 2H3H @ 1390 MHz



PAON4 A04 (elev=11.4) and expected 1H4H @ 1390 MHz



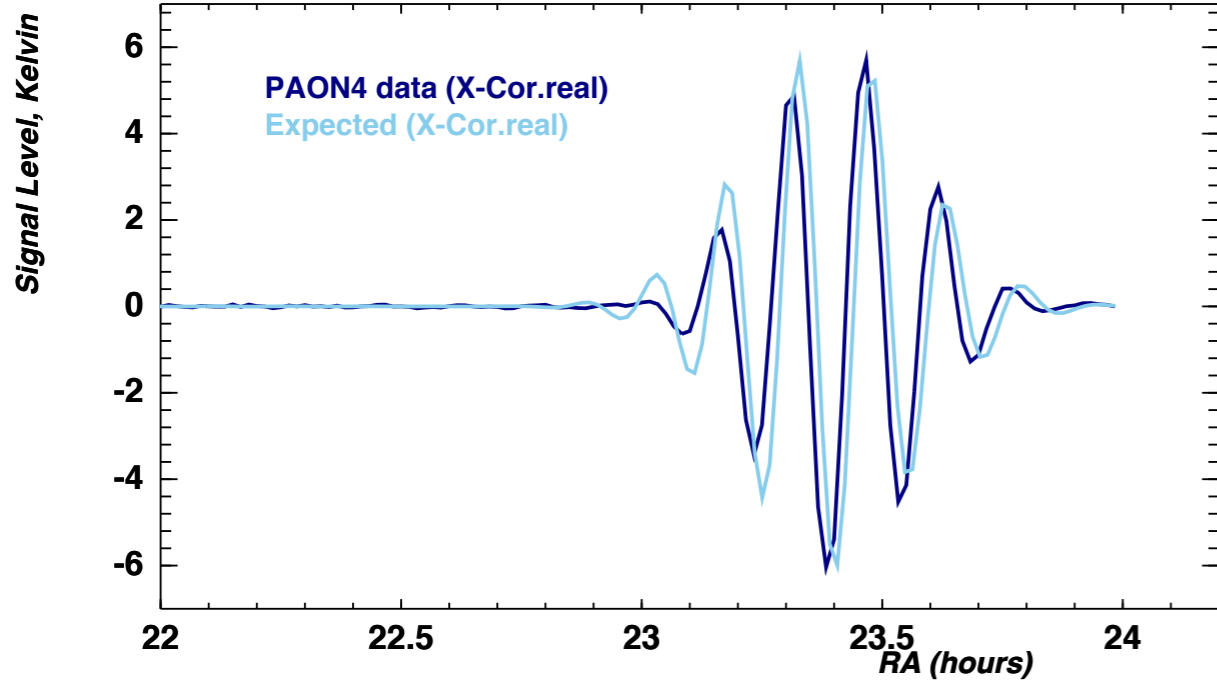
PAON4 A04 (elev=11.4) and expected 2H3H @ 1390 MHz



Scan A04 / Elev=11.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

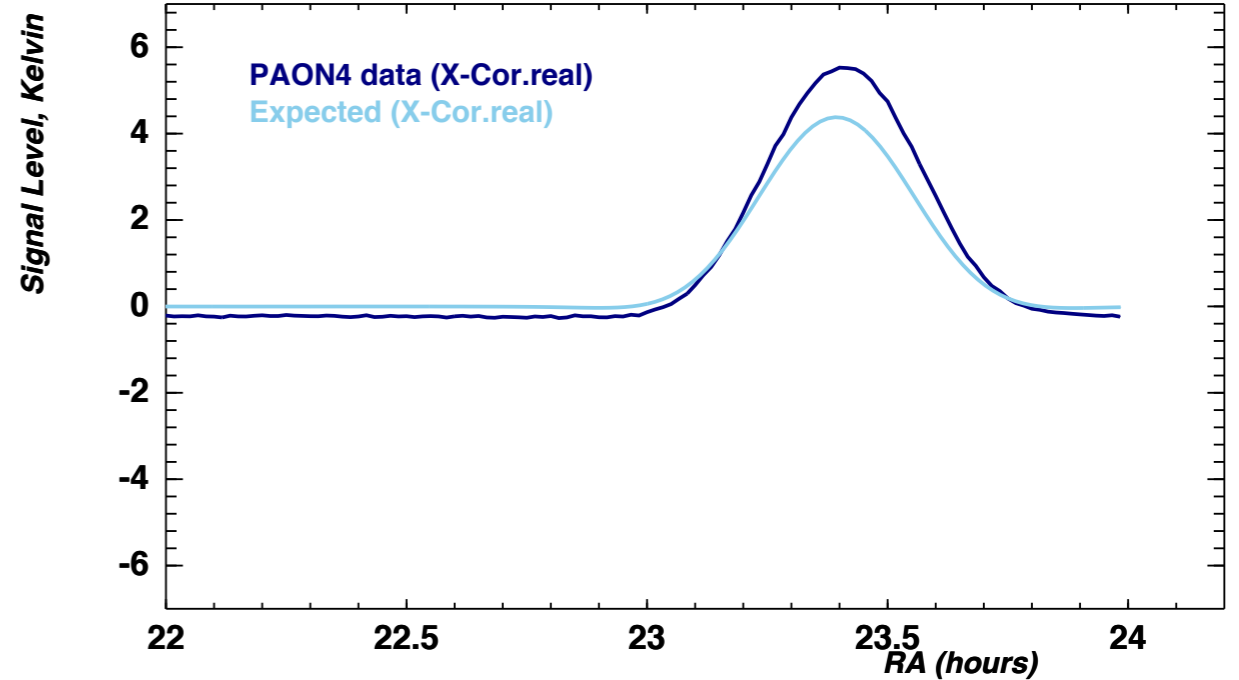
2H3H

PAON4 A04 (elev=11.4) and expected 2H4H @ 1390 MHz

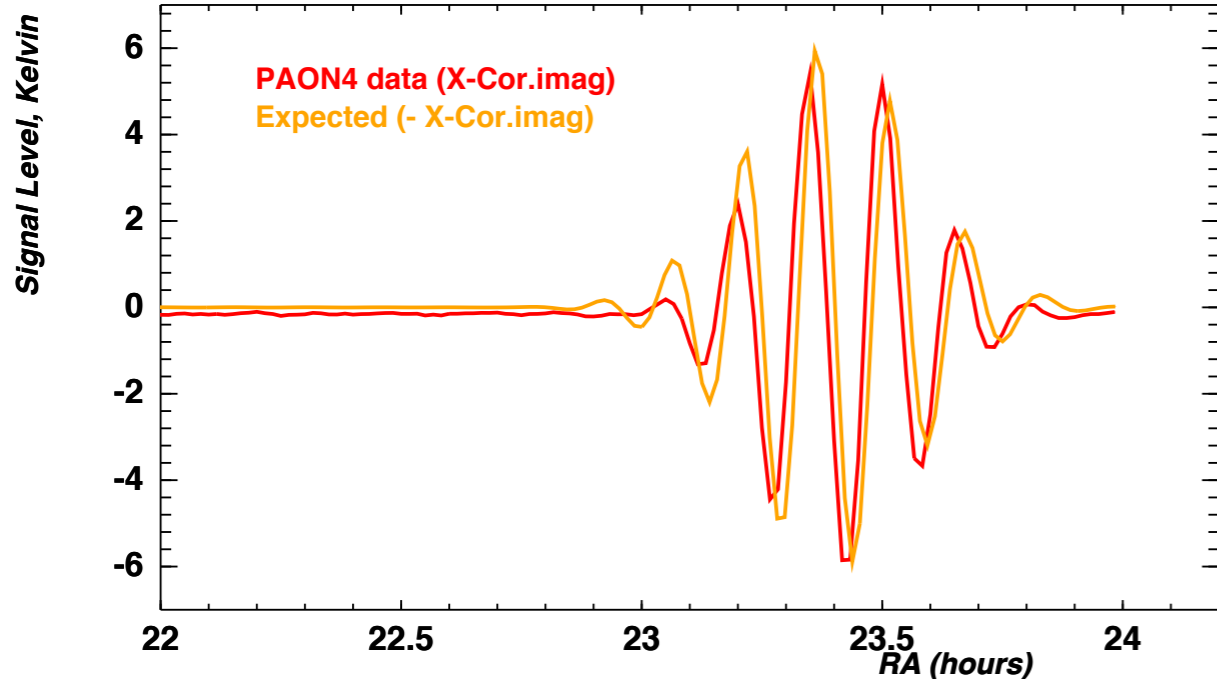


3H4H

PAON4 A04 (elev=11.4) and expected 3H4H @ 1390 MHz

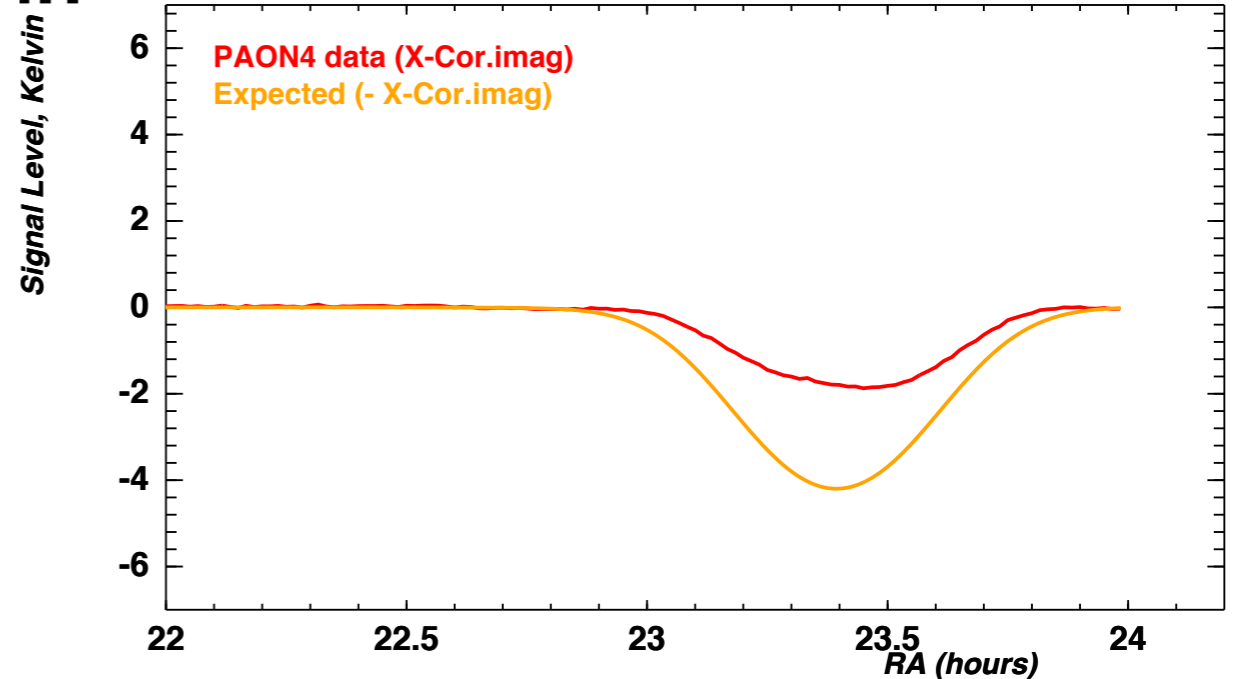


PAON4 A04 (elev=11.4) and expected 2H4H @ 1390 MHz



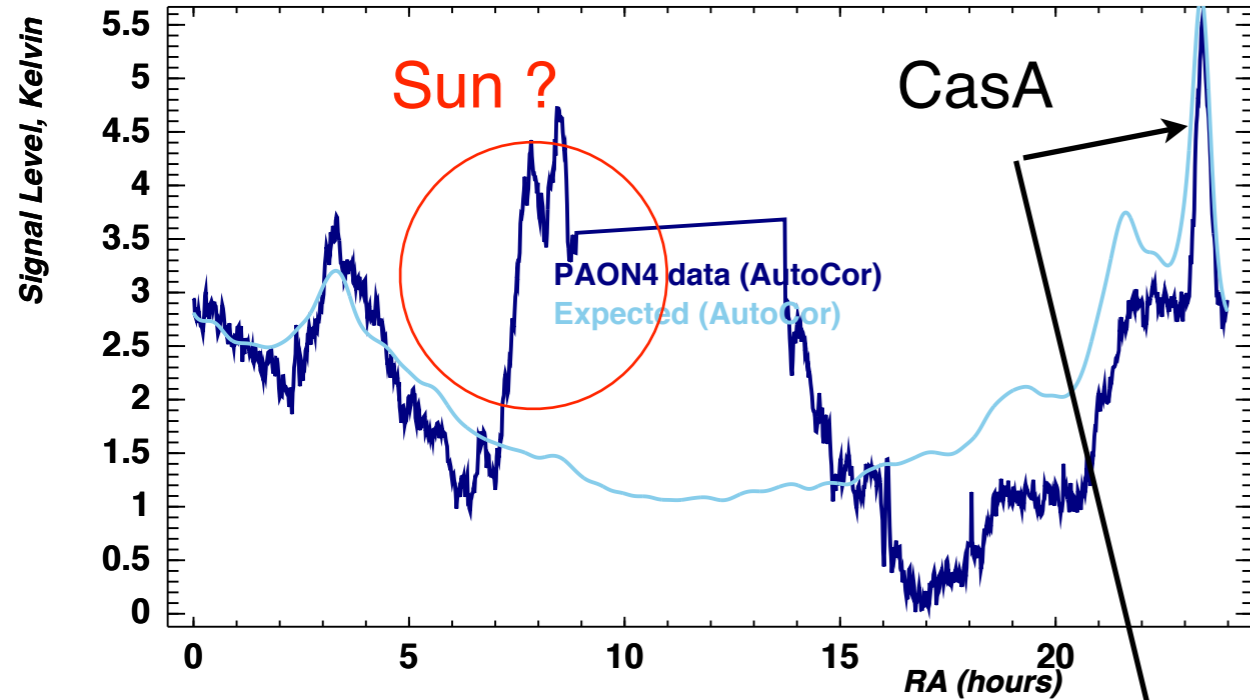
2H4H

PAON4 A04 (elev=11.4) and expected 3H4H @ 1390 MHz

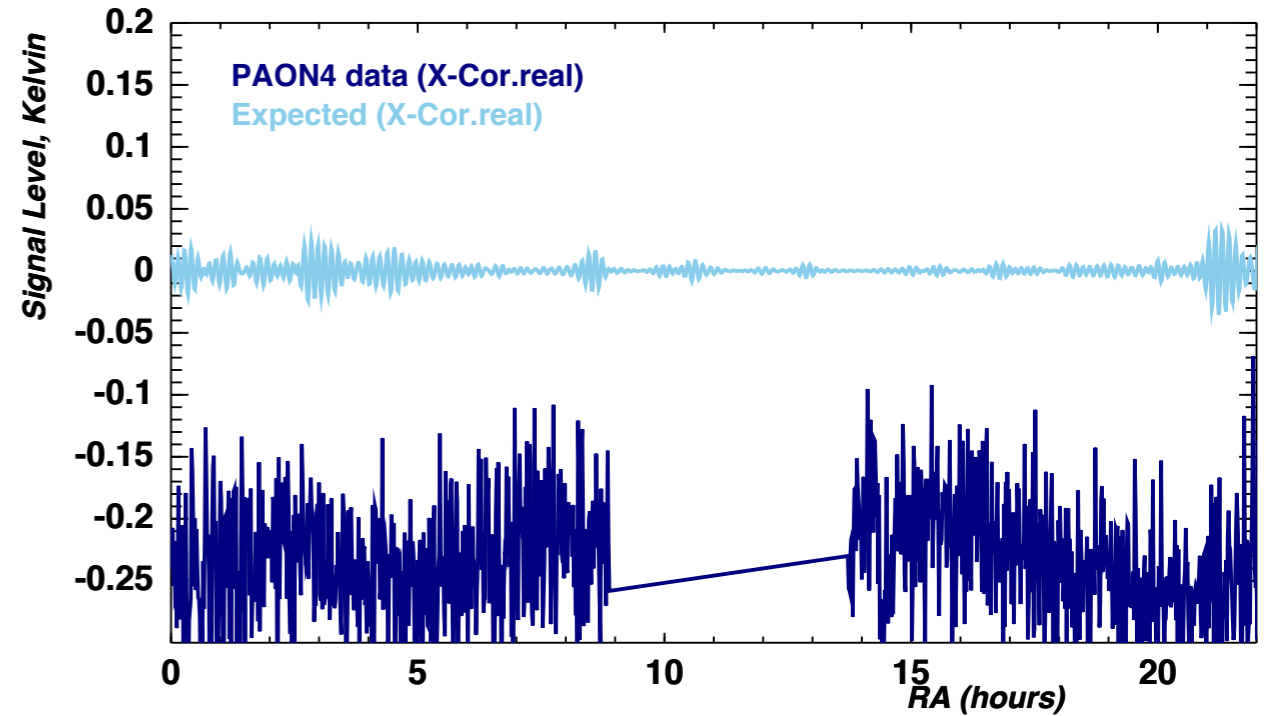


Scan A16 du 14/08 Elev=9.4 - 2 deg de CasA

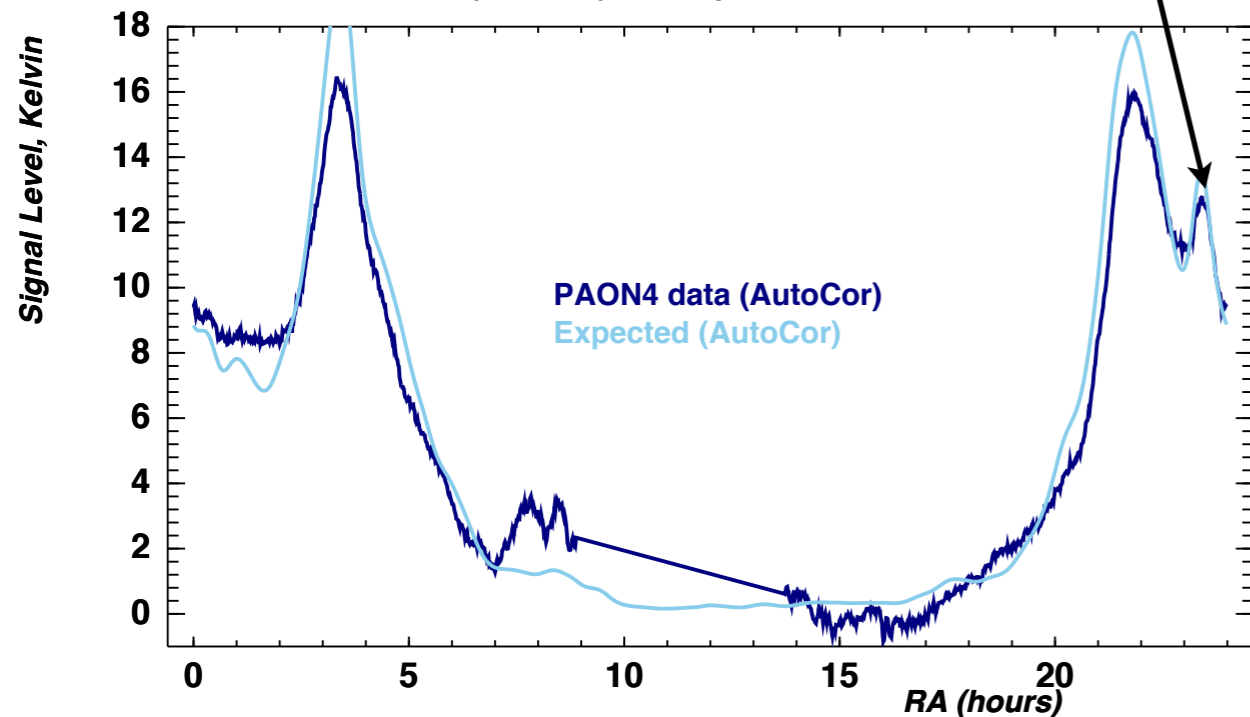
PAON4 A16 (elev=9.4) and expected AutoCor @ 1390 MHz



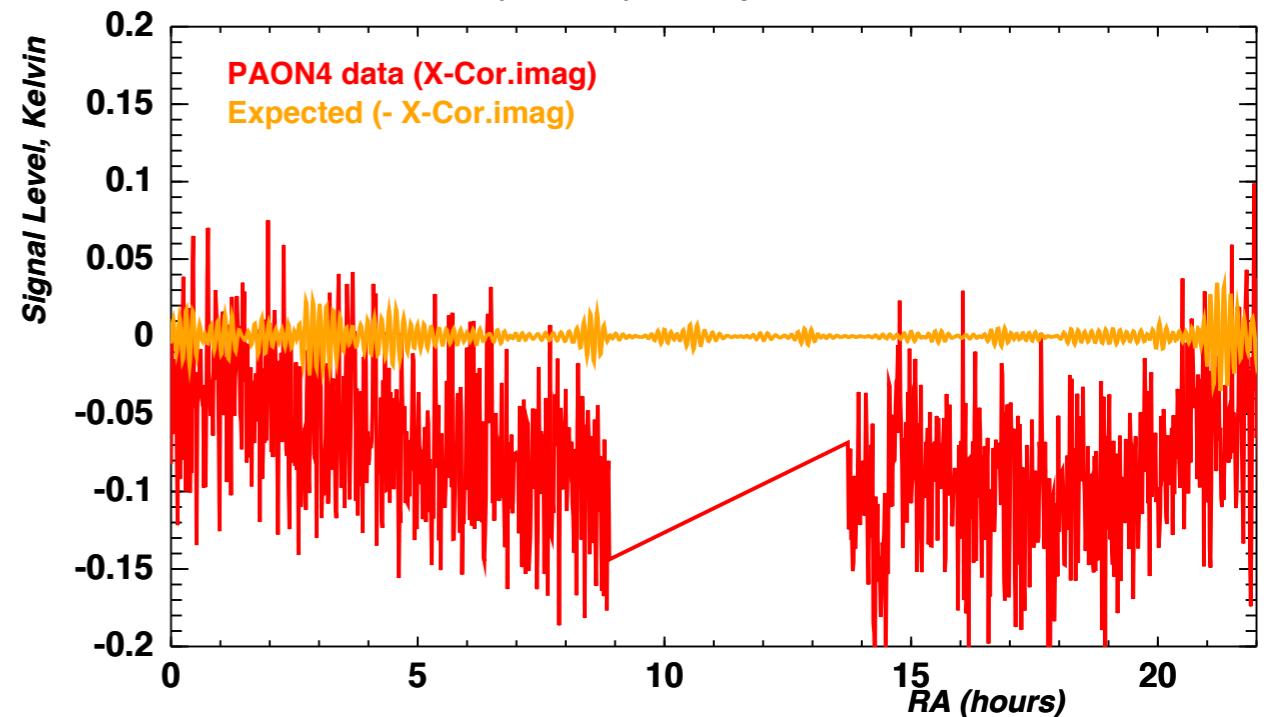
PAON4 A16 (elev=9.4) and expected 2H4H @ 1420 MHz



PAON4 A16 (elev=9.4) and expected AutoCor @ 1420 MHz



PAON4 A16 (elev=9.4) and expected 2H4H @ 1420 MHz



Auto-corrélation

Cross-Corr (real/imag) en dehors du transit CasA @ 1420 MHz

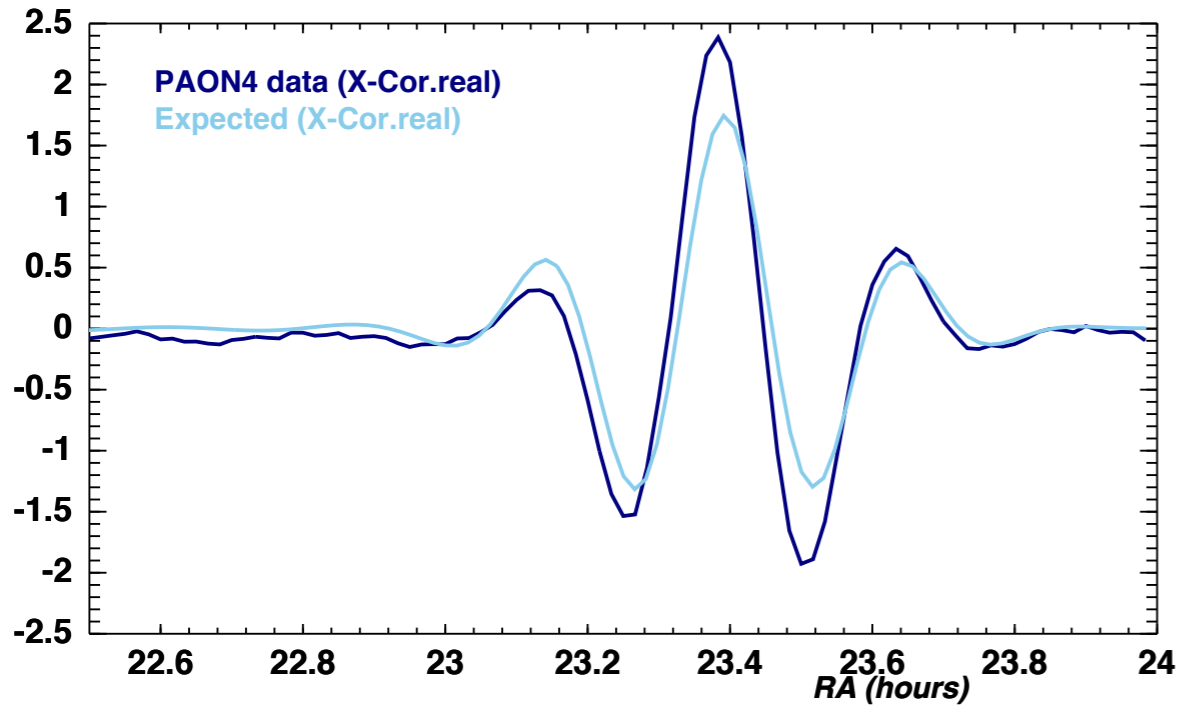
Scan **A16** / Elev=9.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

① La correction ne semble plus correcte - probablement suite à la coupure/remise en route de la baie électronique

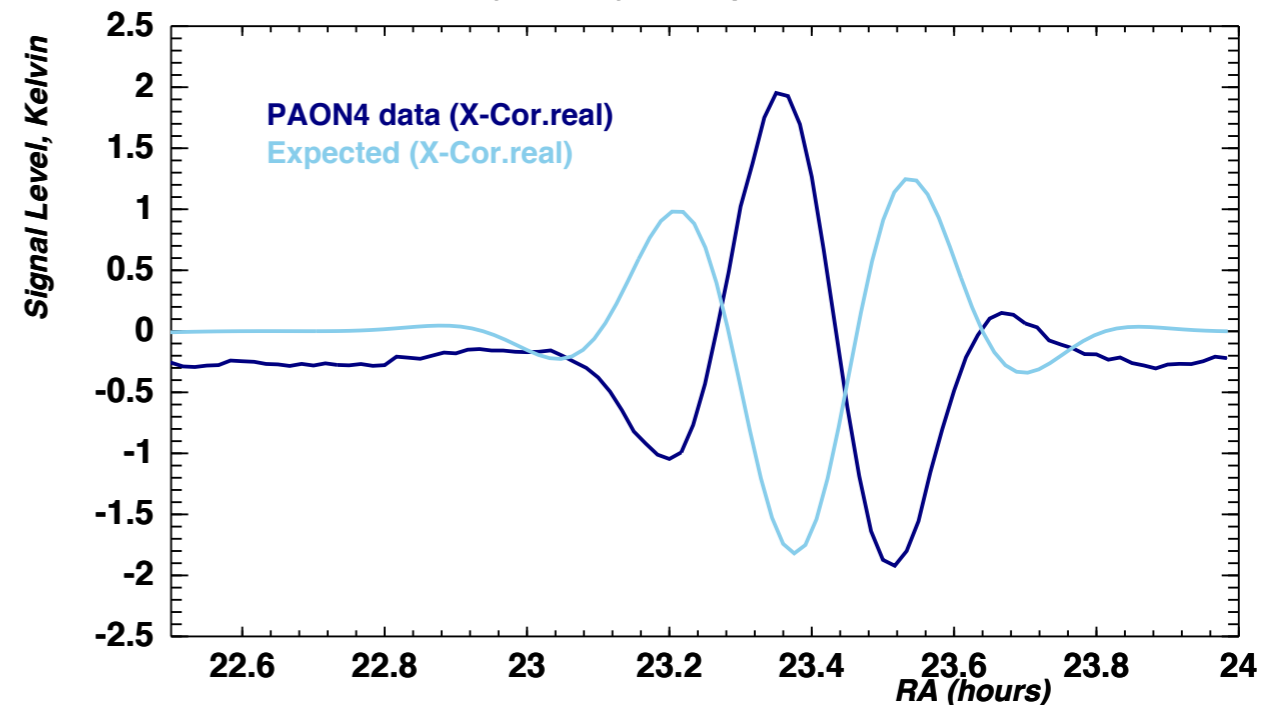
IH2H

IH3H

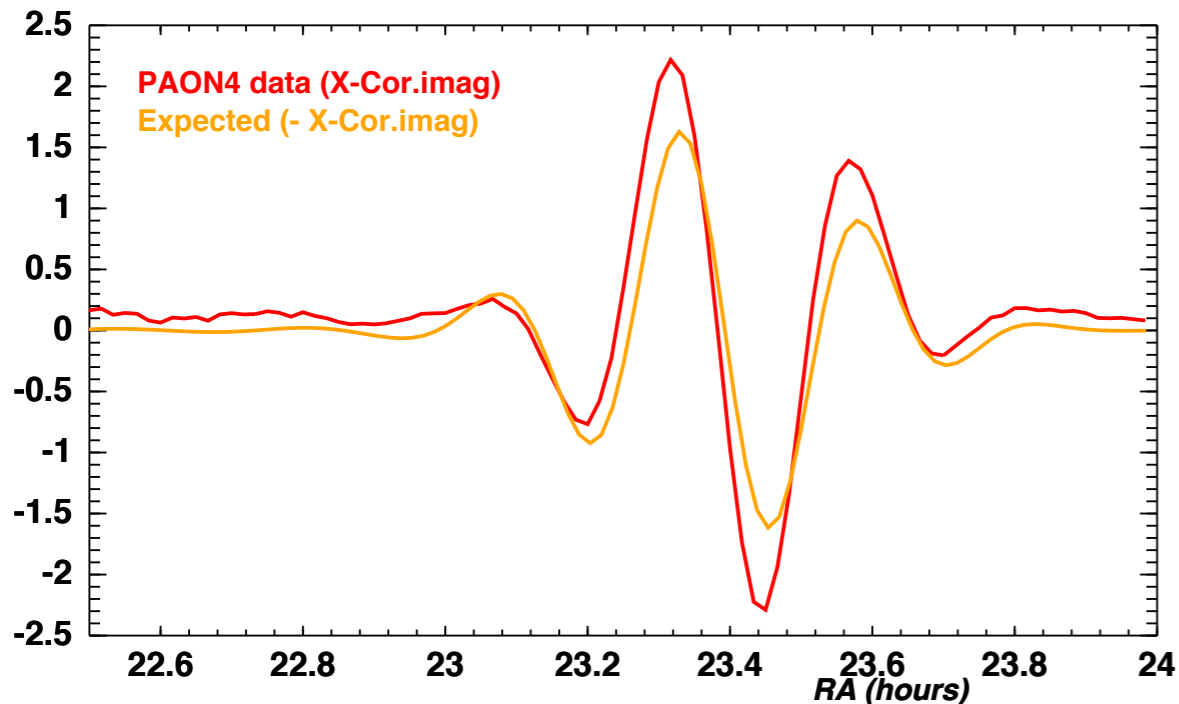
PAON4 A16 (elev=9.4) and expected IH2H @ 1390 MHz



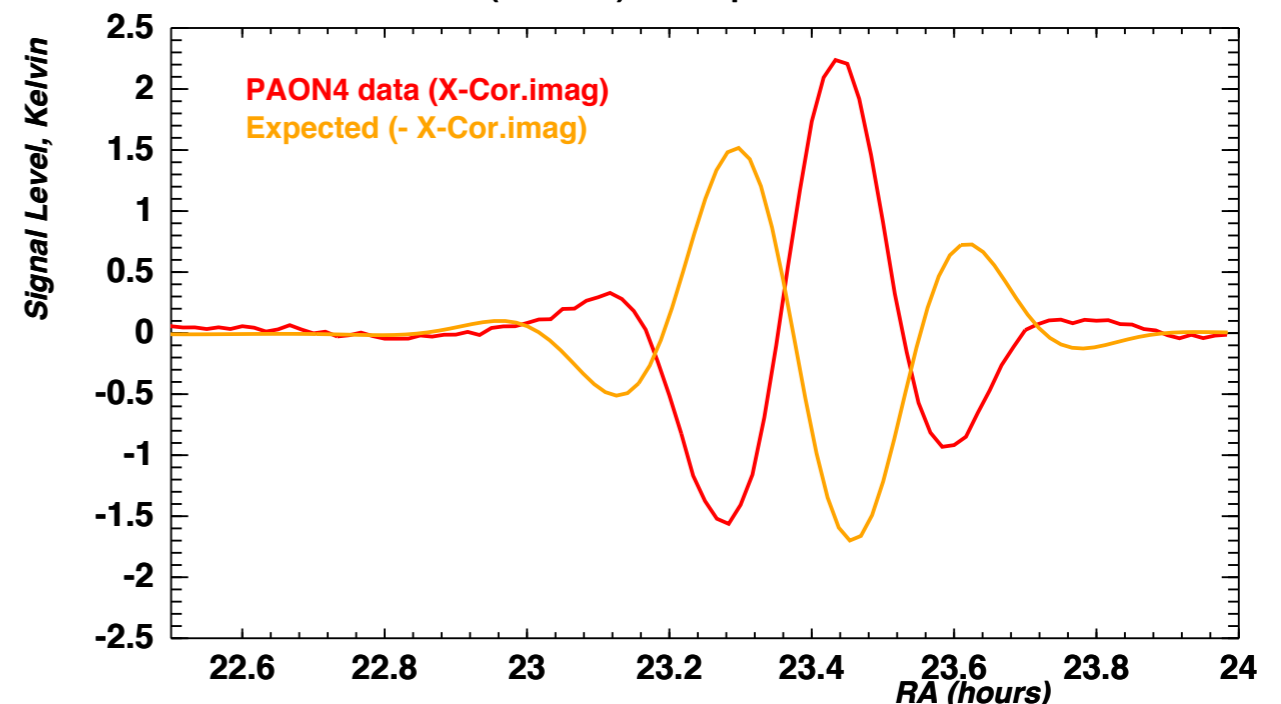
PAON4 A16 (elev=9.4) and expected IH3H @ 1390 MHz



PAON4 A16 (elev=9.4) and expected IH2H @ 1390 MHz



PAON4 A16 (elev=9.4) and expected IH3H @ 1390 MHz

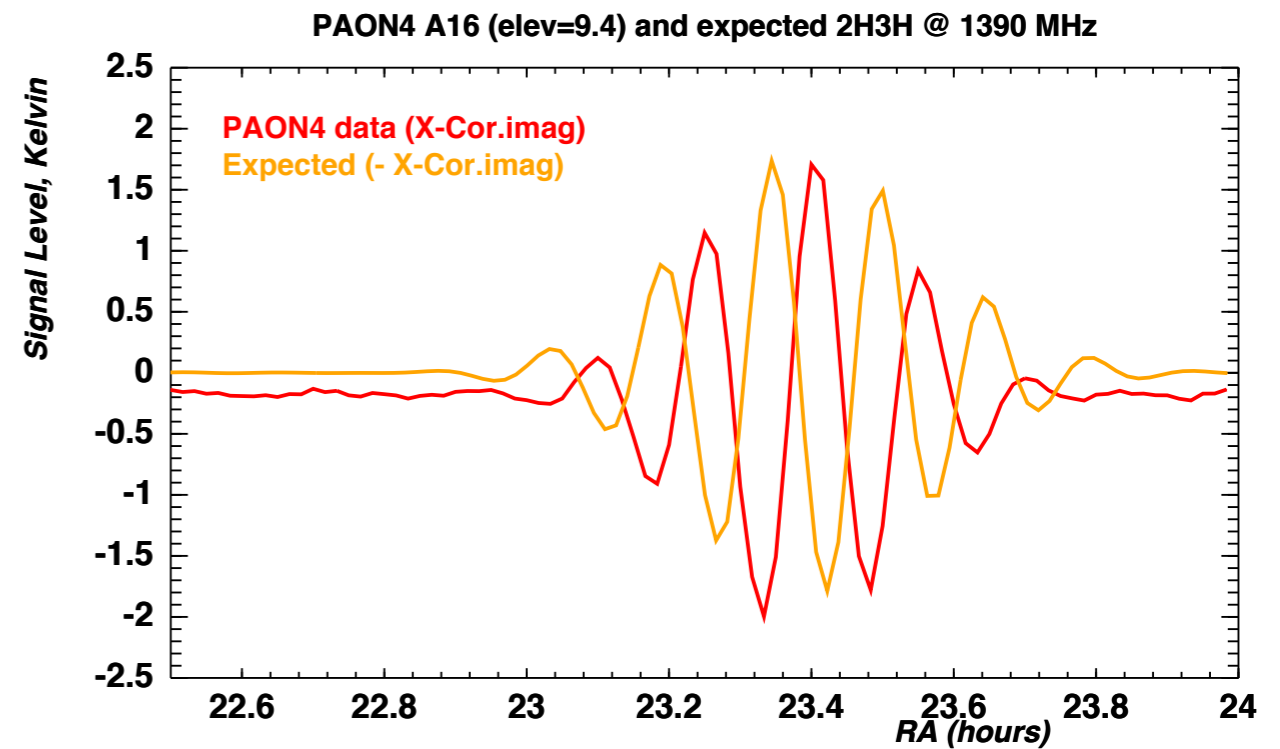
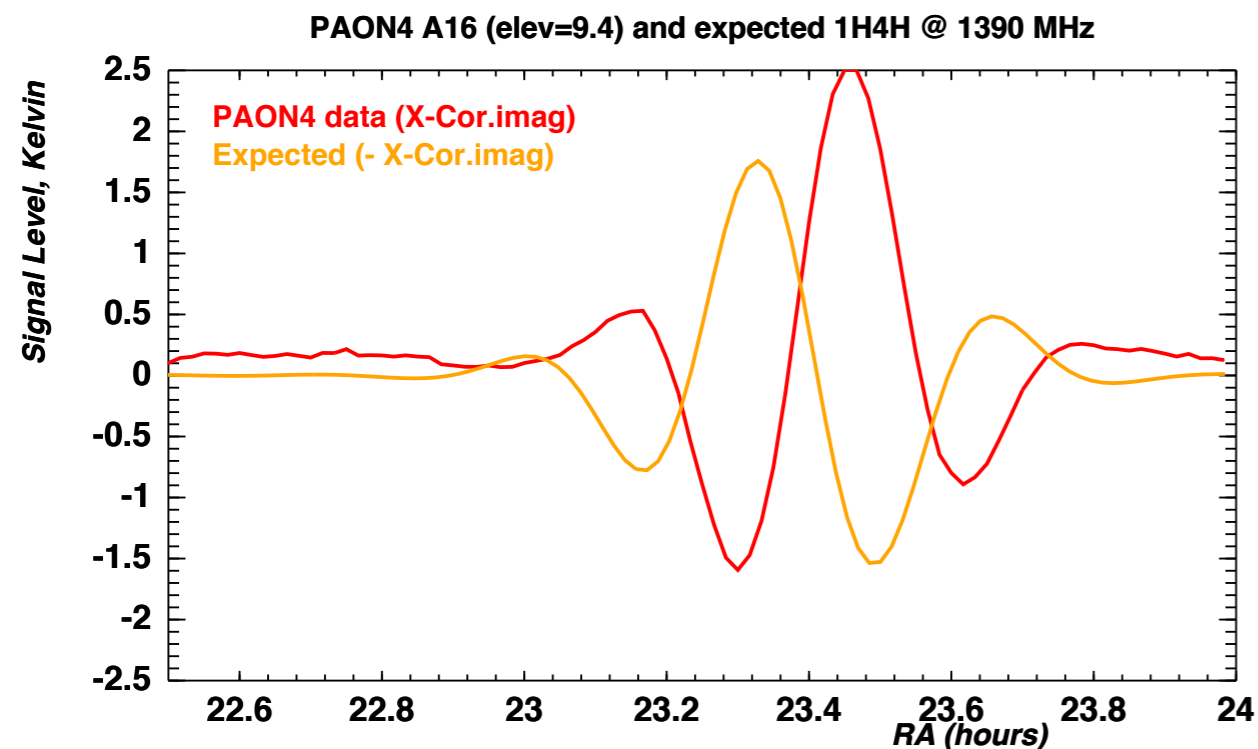
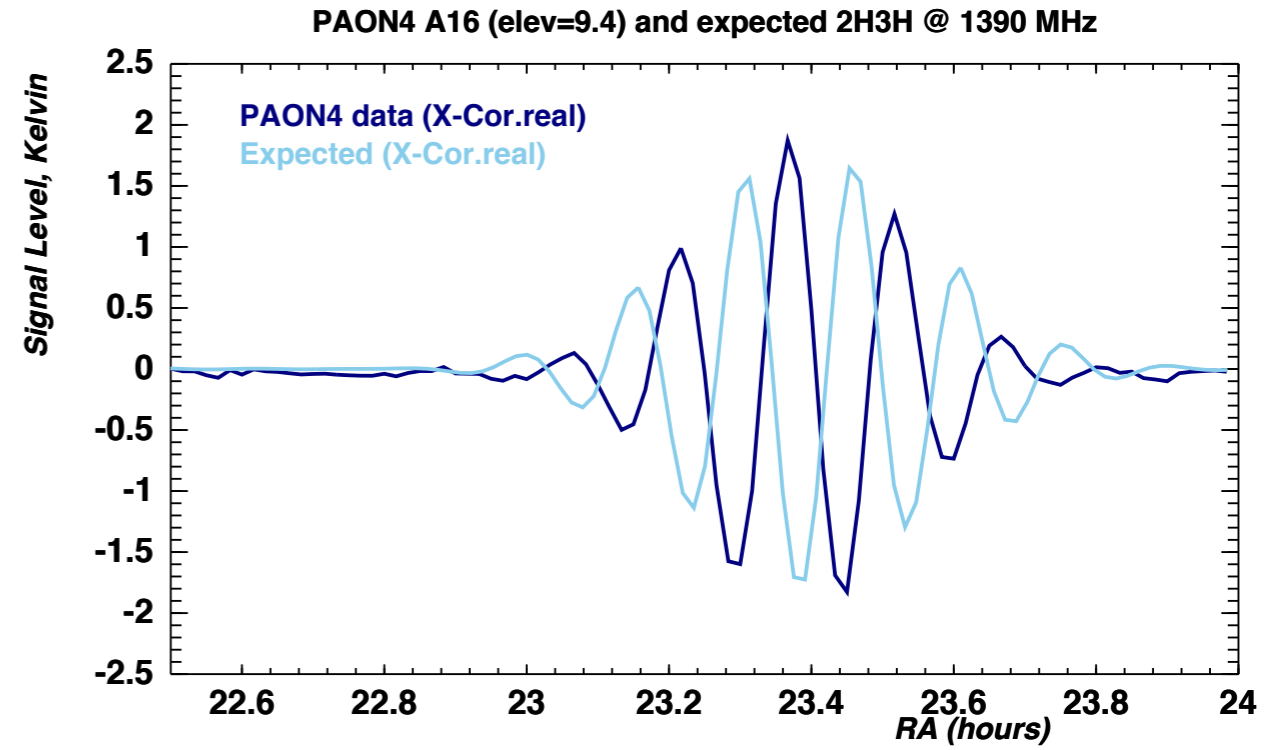
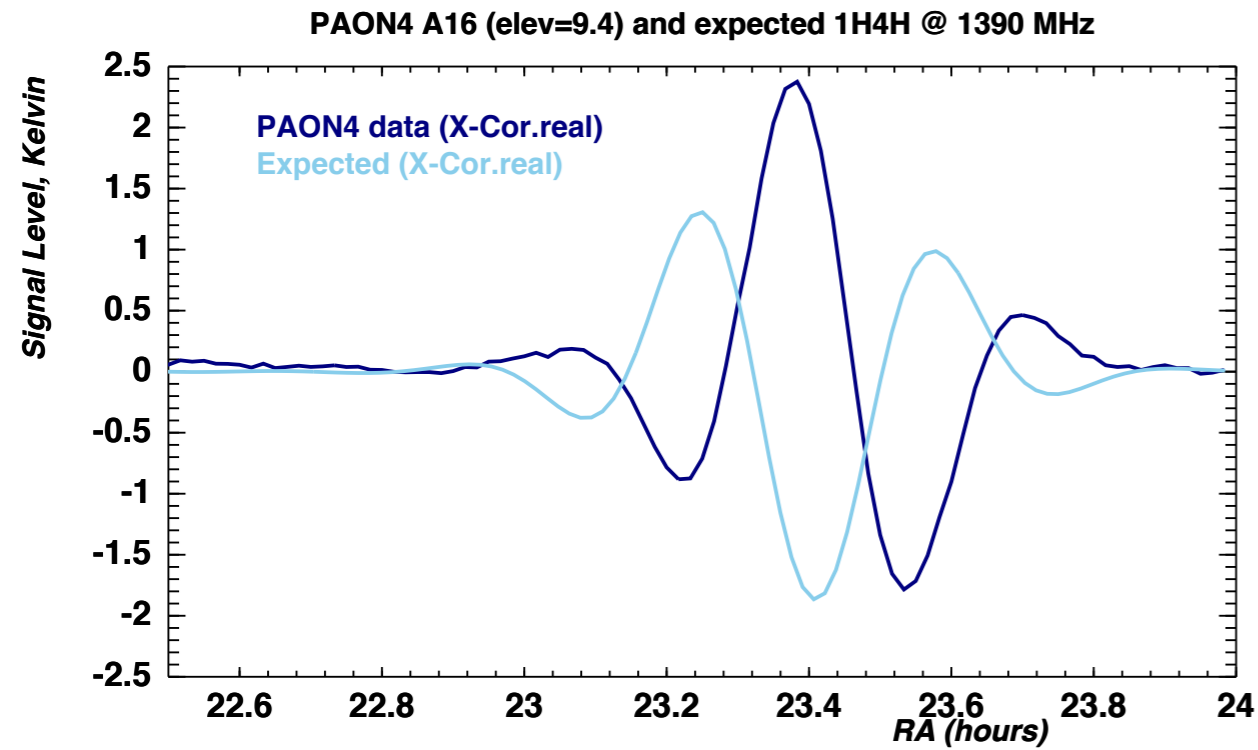


Scan **A16** / Elev=9.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

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1H4H

2H3H

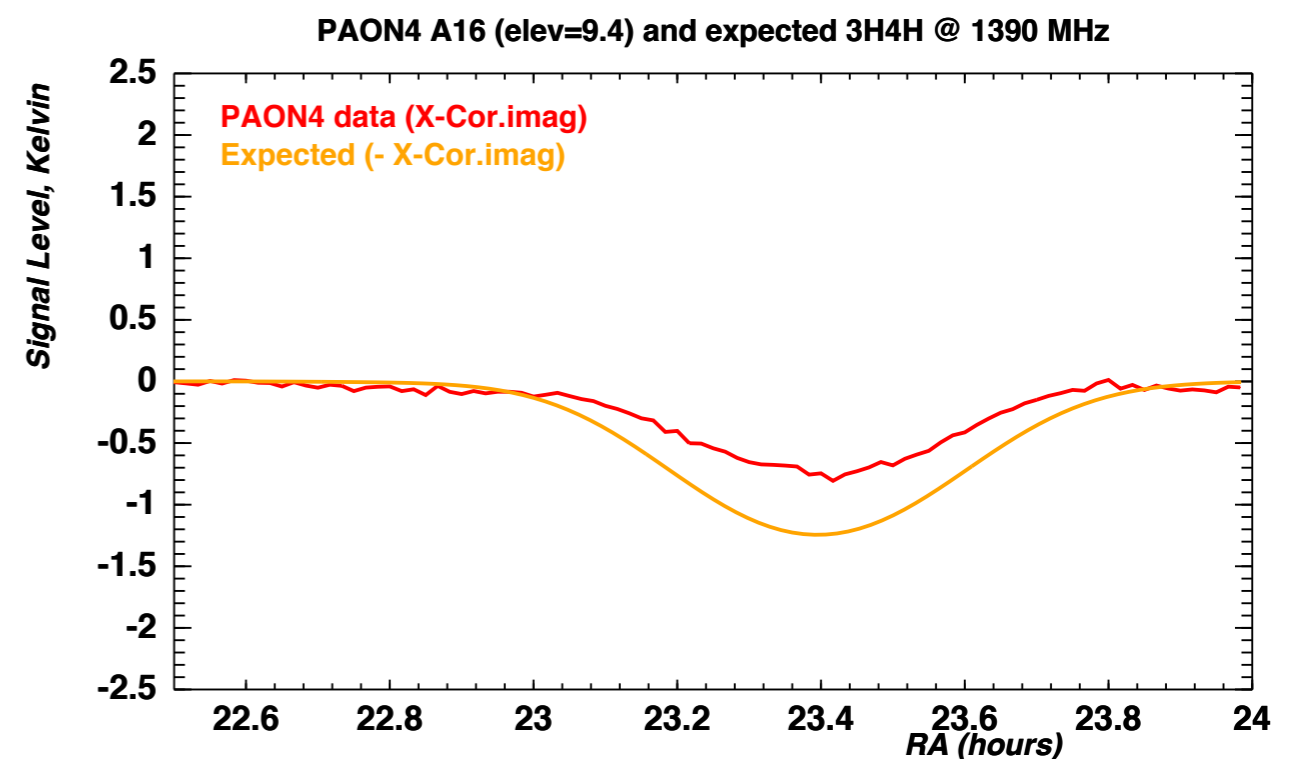
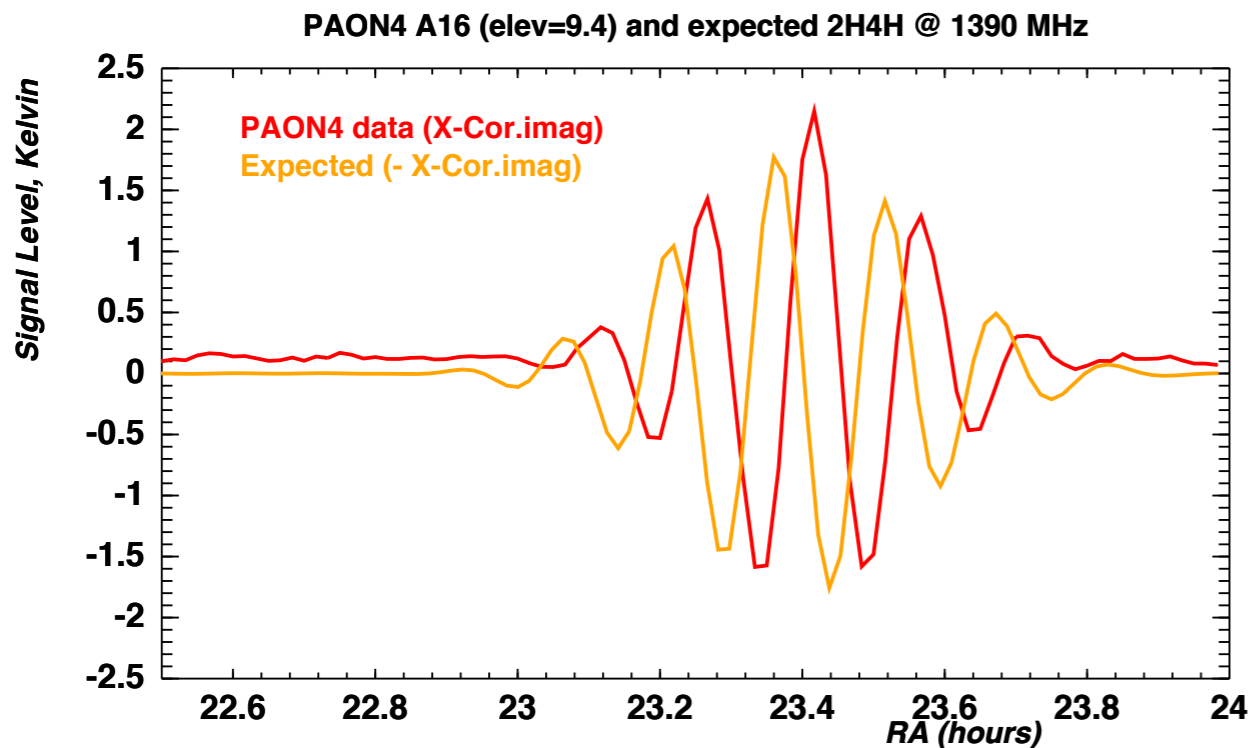
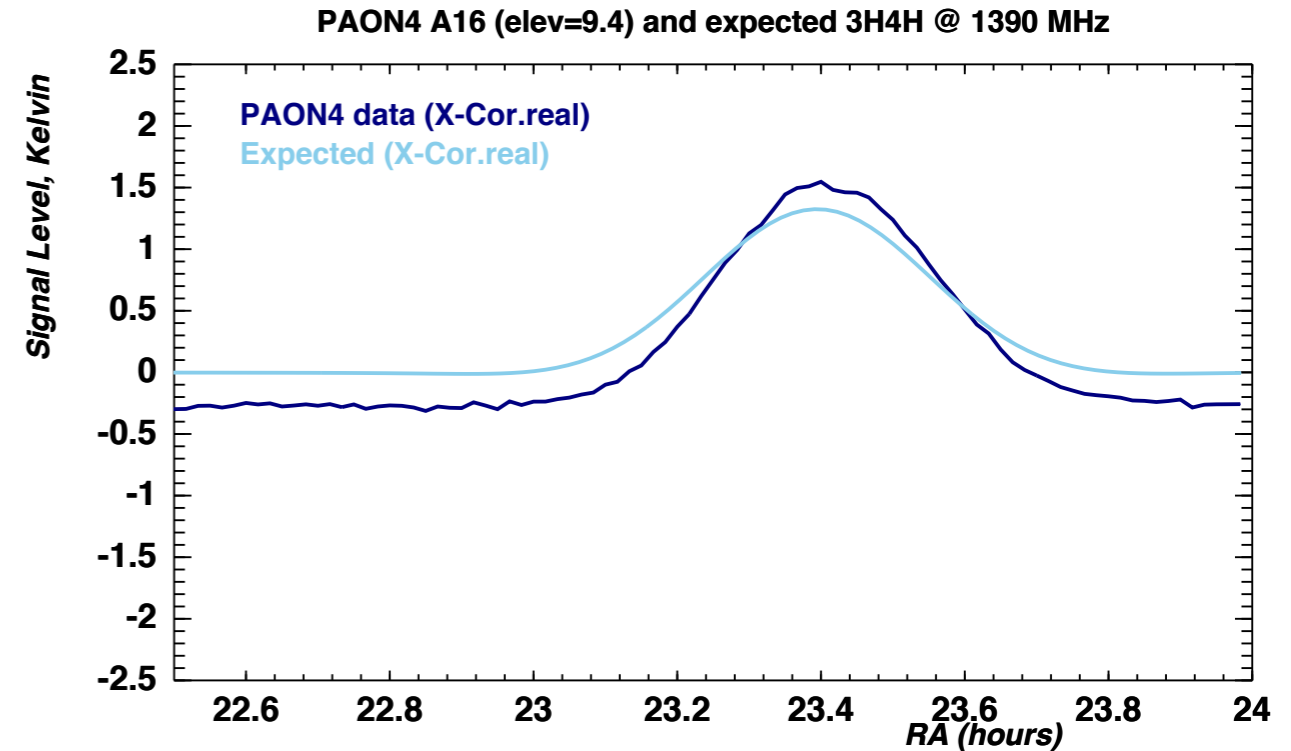
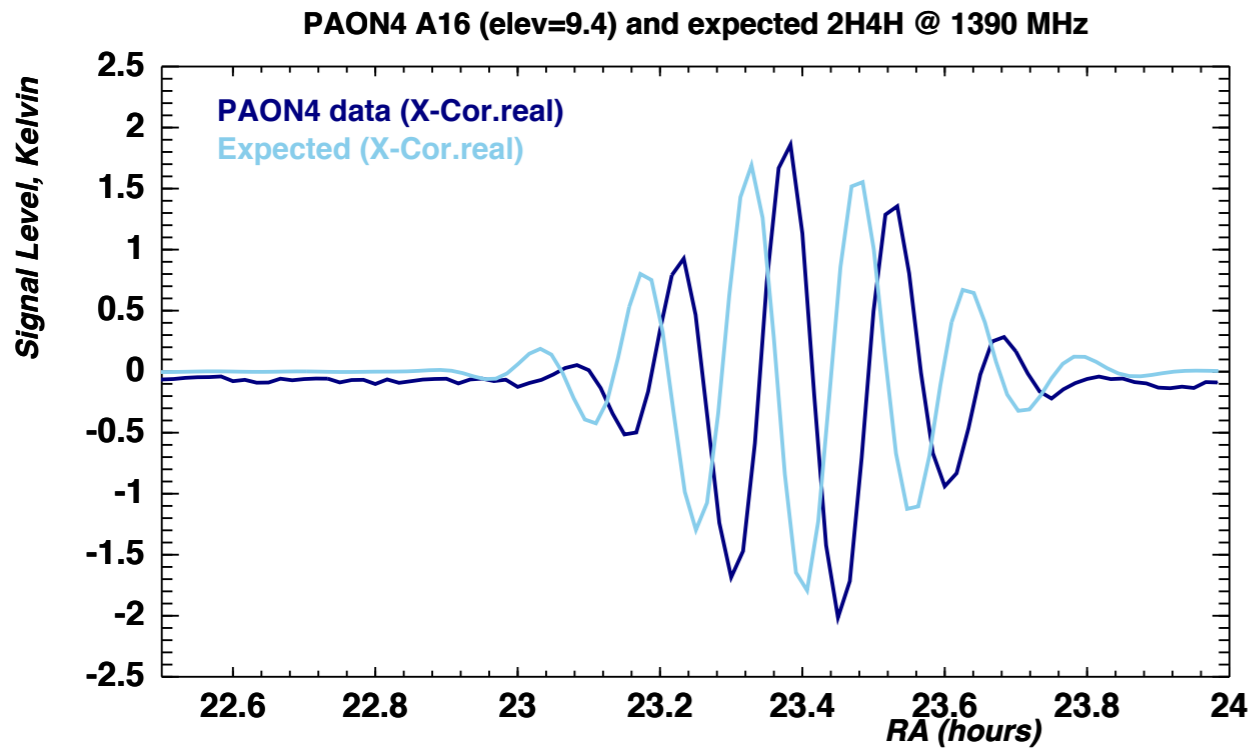


Scan **A16** / Elev=9.4 - Comparaison franges CasA Observées / Attendu à 1395 MHz pour les 6 CxCorr

① La correction ne semble plus correcte - probablement suite à la coupure/remise en route de la baie électronique

2H4H

3H4H

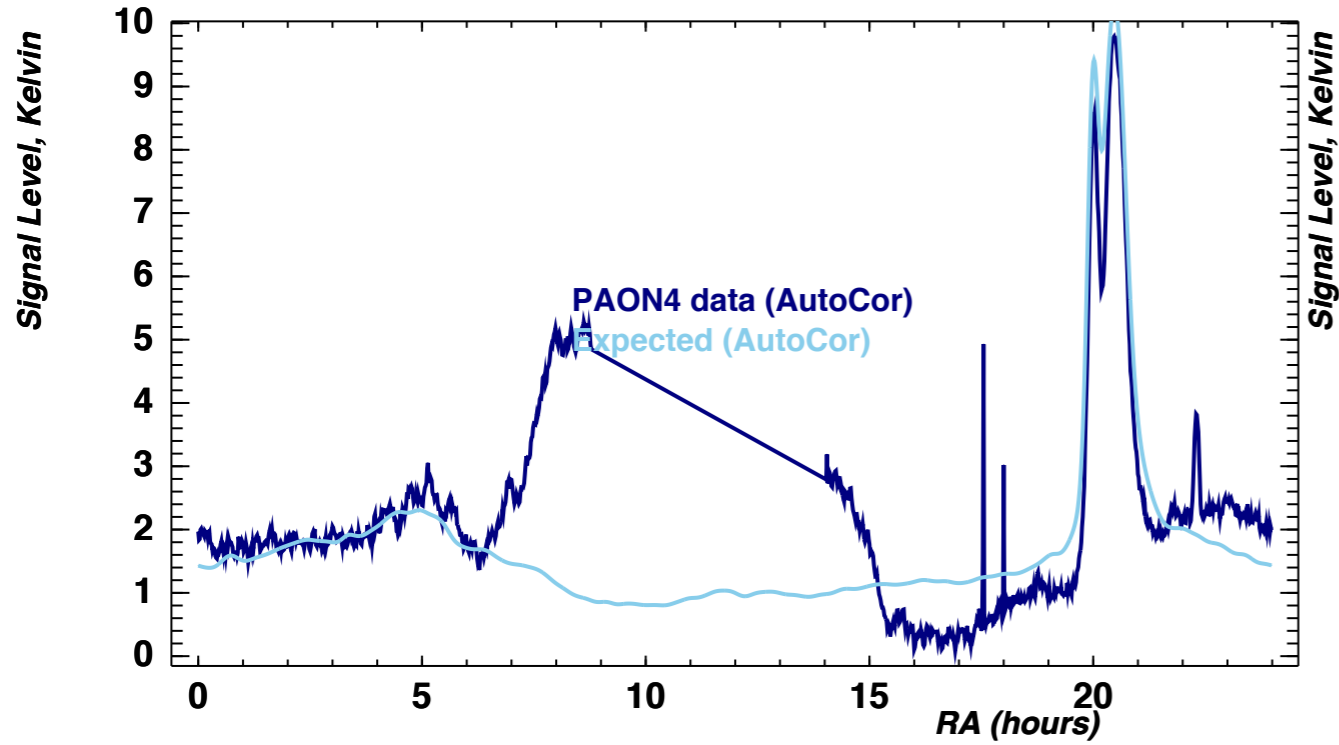


Sources brillantes

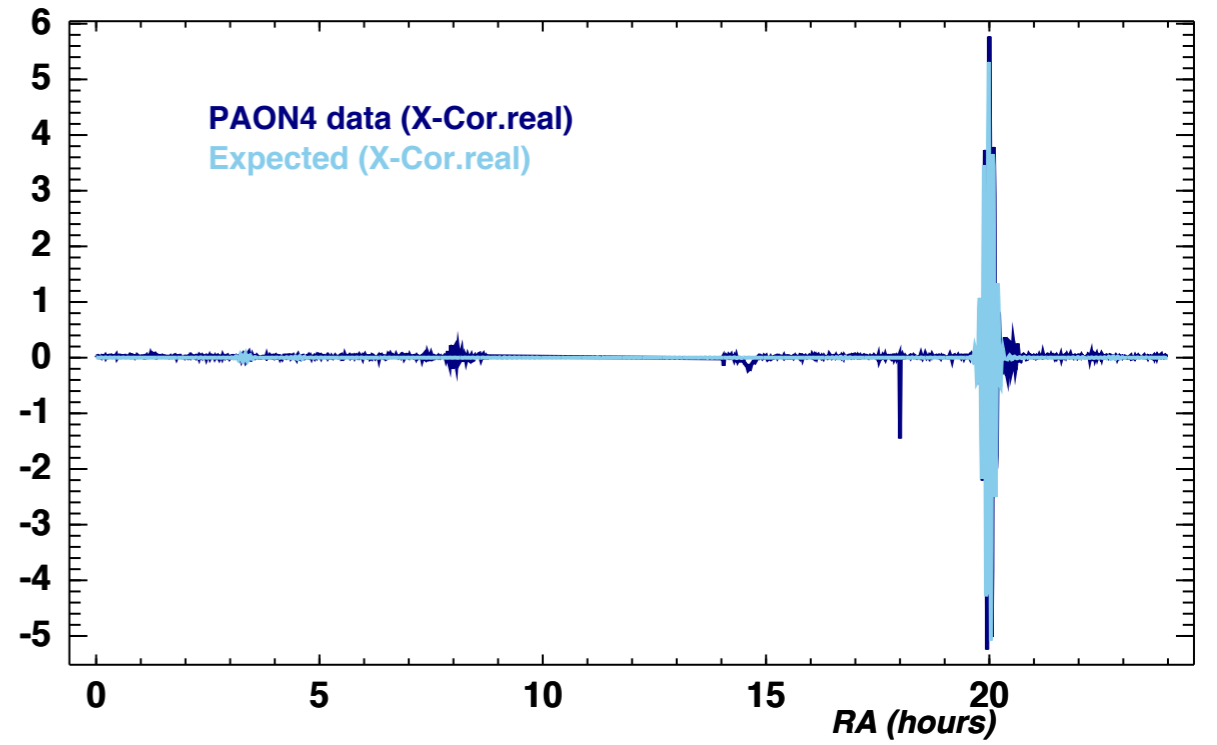
CygA ($\alpha=19^{\text{h}}59.5$, $\delta=40^{\text{d}}44'$) : **A20**

Scan A20 du 18/08 Elev=-6.6 - Declinaison de CygA

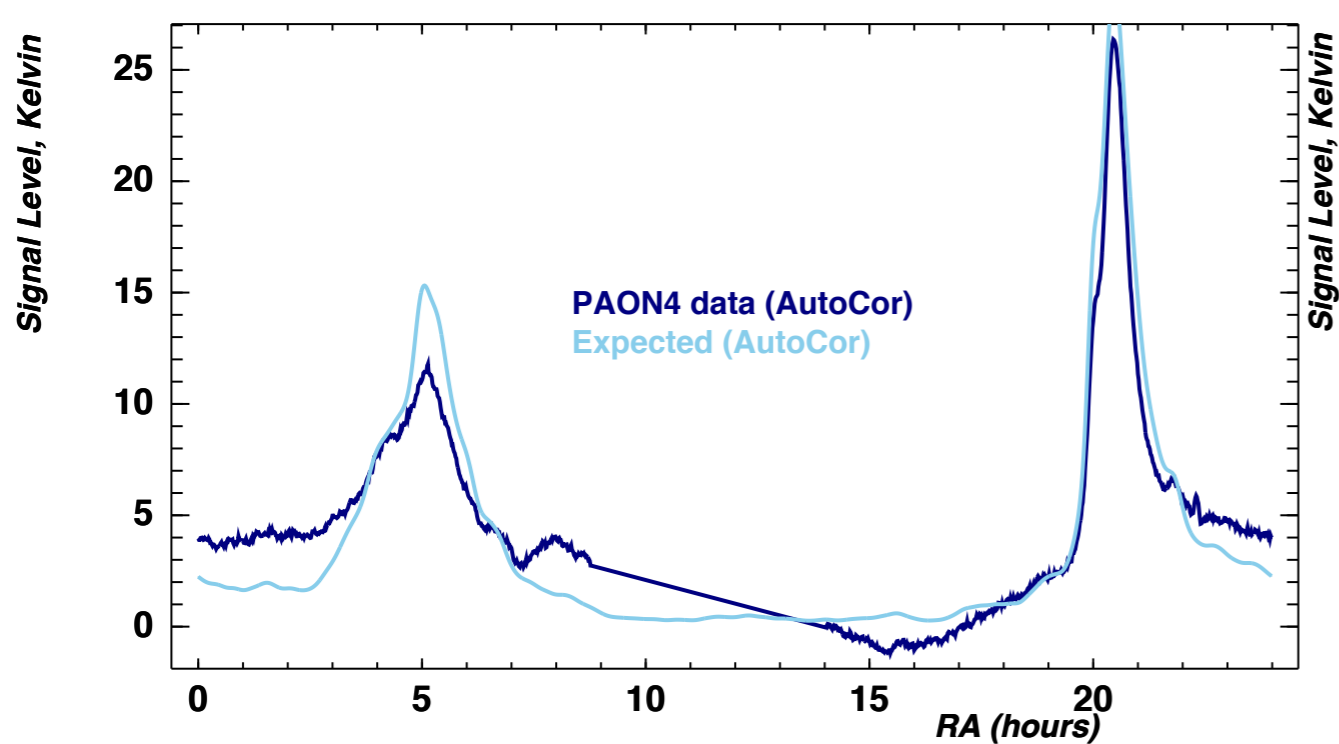
PAON4 A20 (elev=-6.6) and expected AutoCor @ 1390 MHz



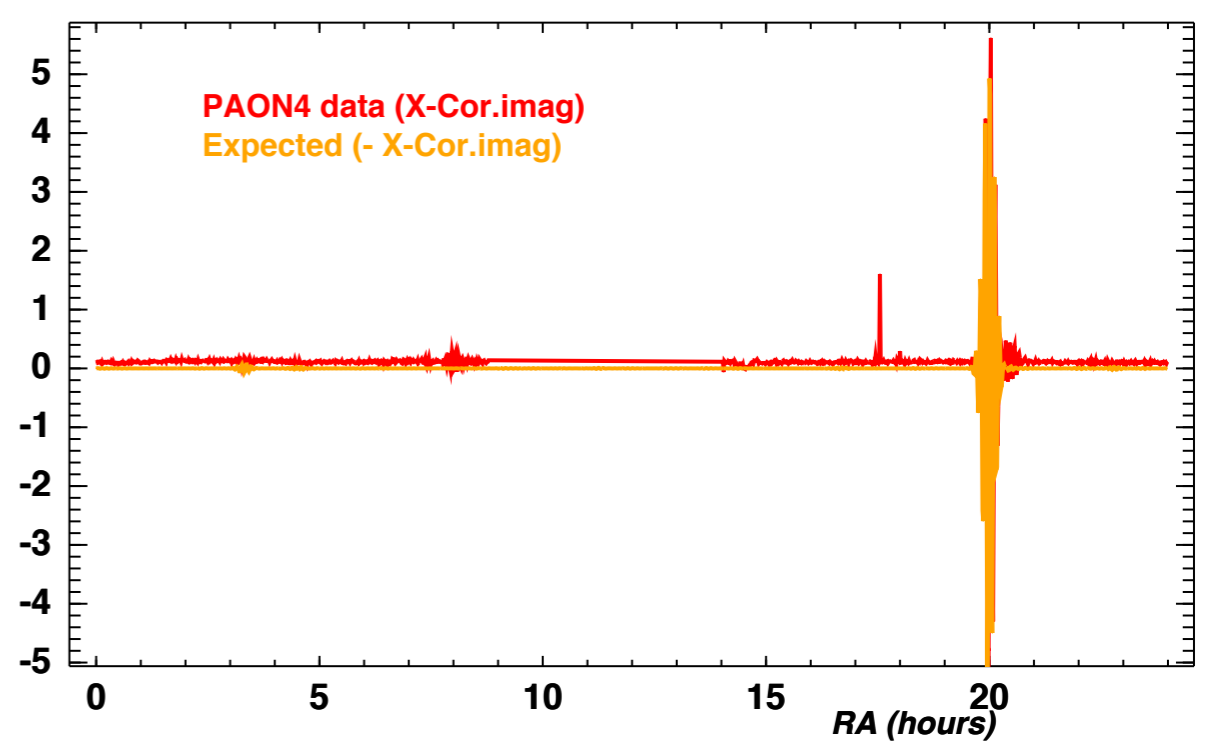
PAON4 A20 (elev=-6.6) and expected 2H4H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected AutoCor @ 1420 MHz



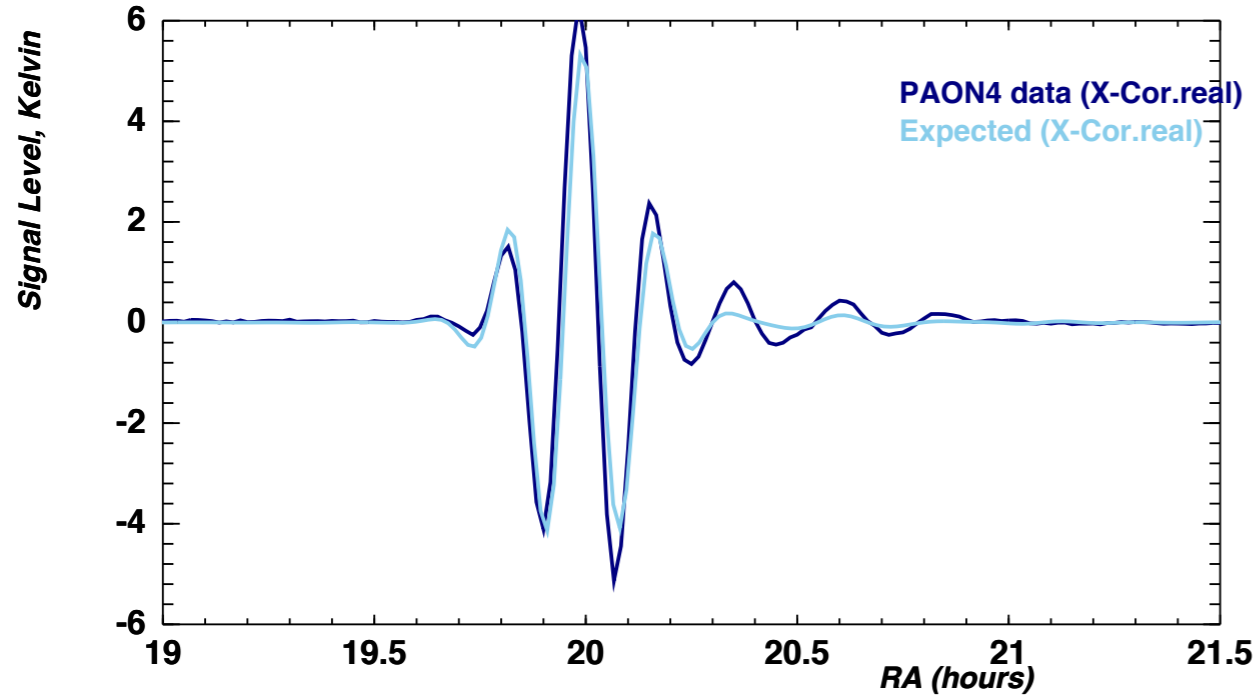
PAON4 A20 (elev=-6.6) and expected 2H4H @ 1390 MHz



Scan A20 du 18/08 Elev=-6.6 - Declinaison de XCor @1395 MHz, autour de CygA

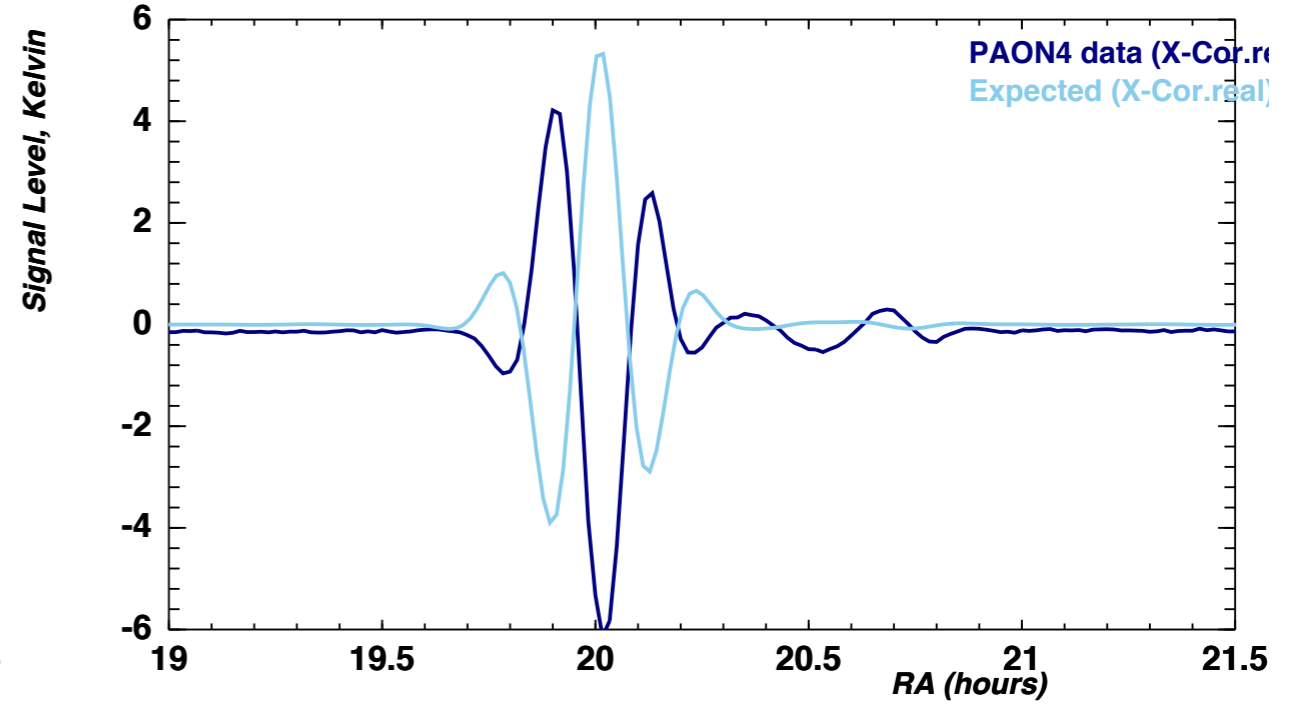
IH2H

PAON4 A20 (elev=-6.6) and expected IH2H @ 1390 MHz

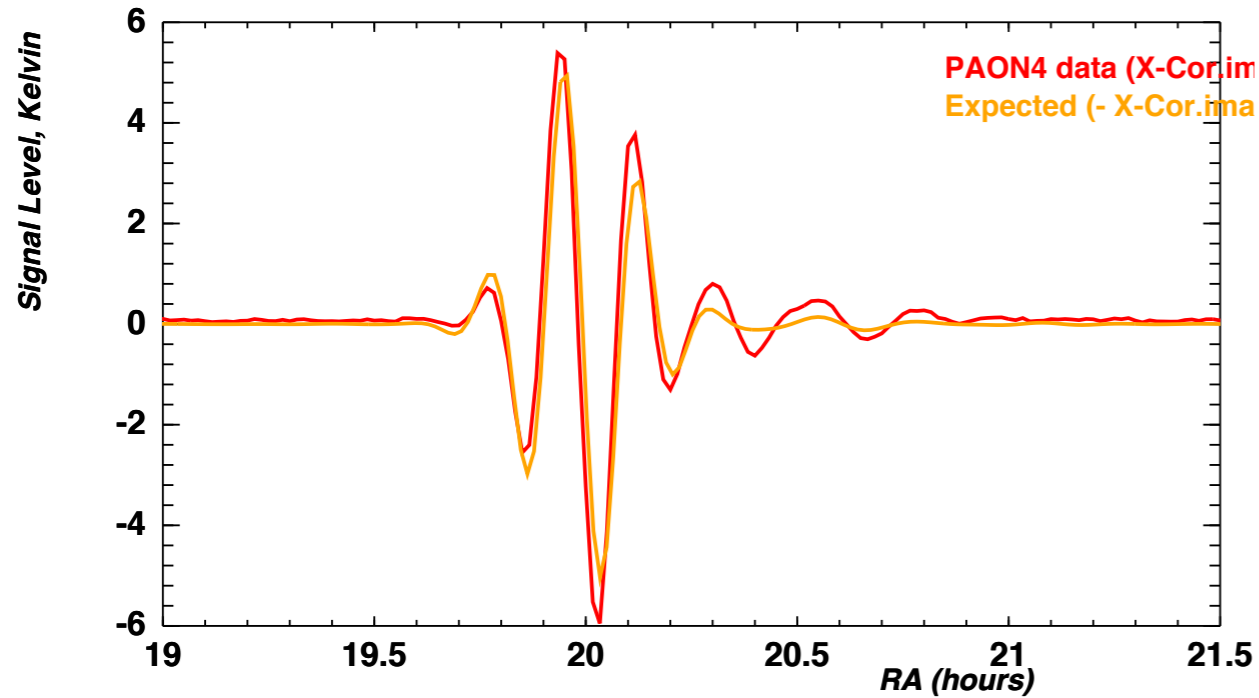


IH3H

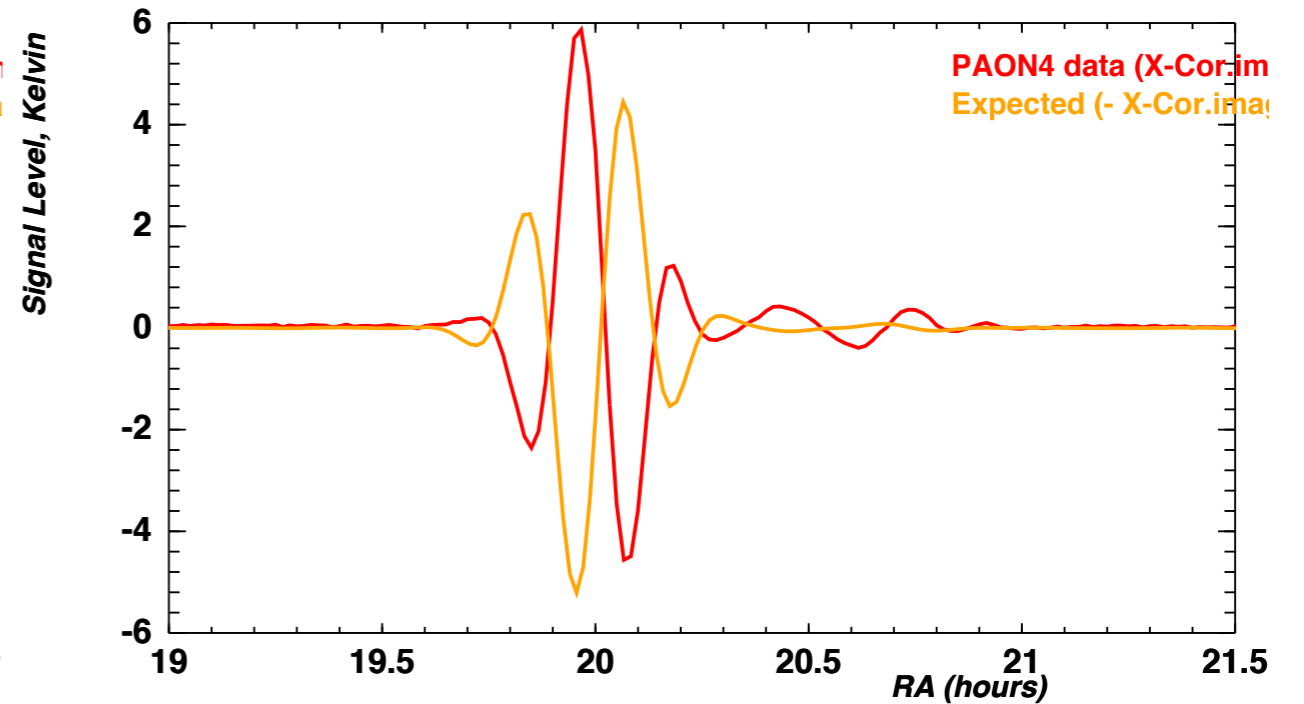
PAON4 A20 (elev=-6.6) and expected IH3H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected IH2H @ 1390 MHz



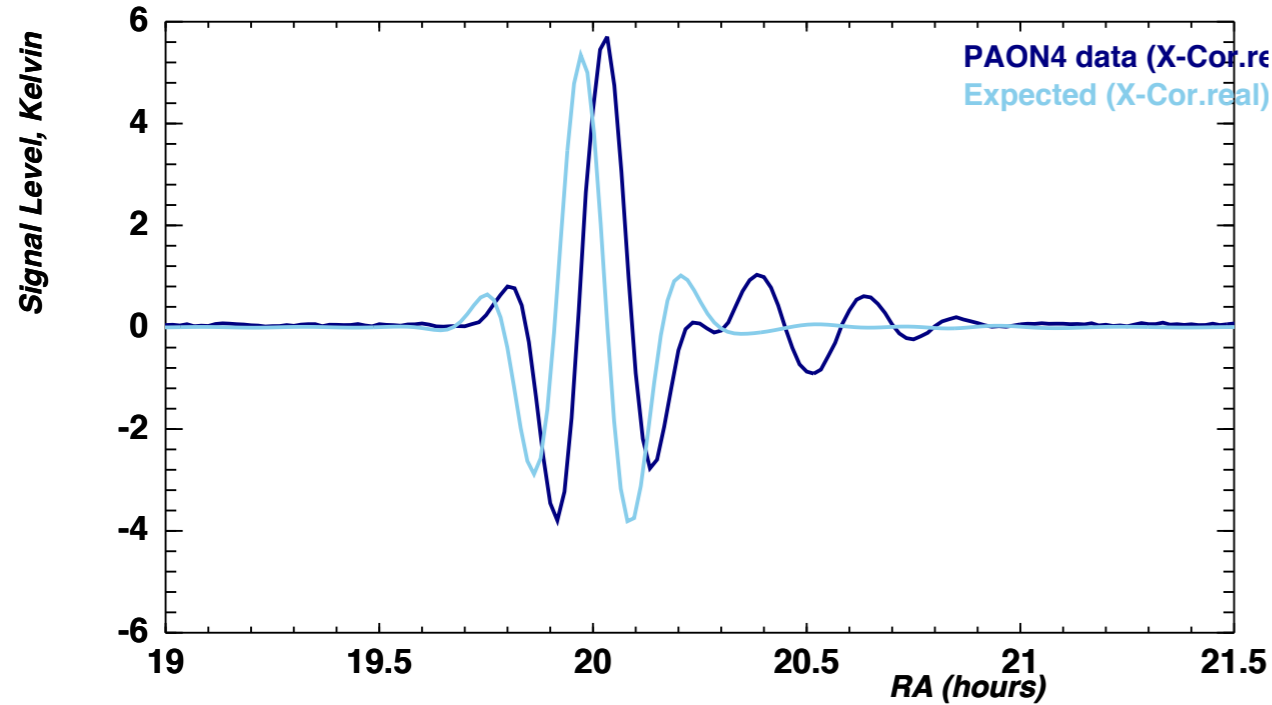
PAON4 A20 (elev=-6.6) and expected IH3H @ 1390 MHz



Scan A20 du 18/08 Elev=-6.6 - Declinaison de XCor @ 1395 MHz, autour de CygA

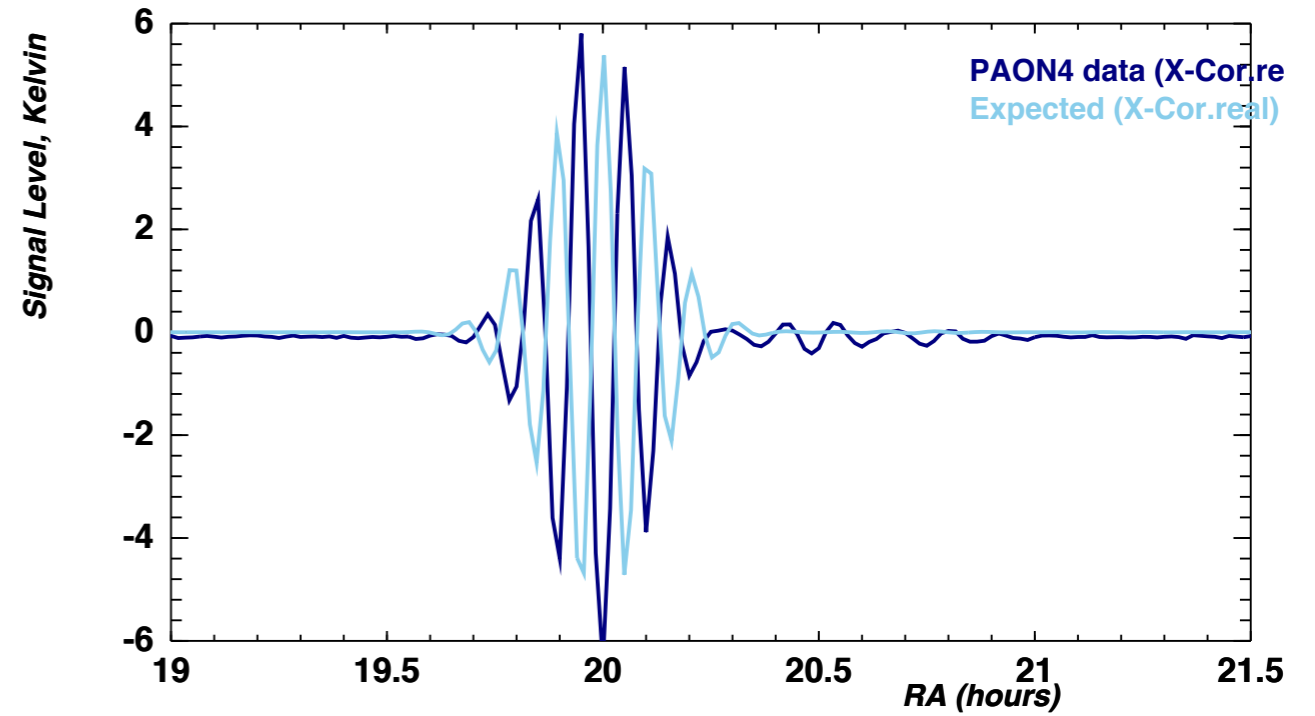
1H4H

PAON4 A20 (elev=-6.6) and expected 1H4H @ 1390 MHz

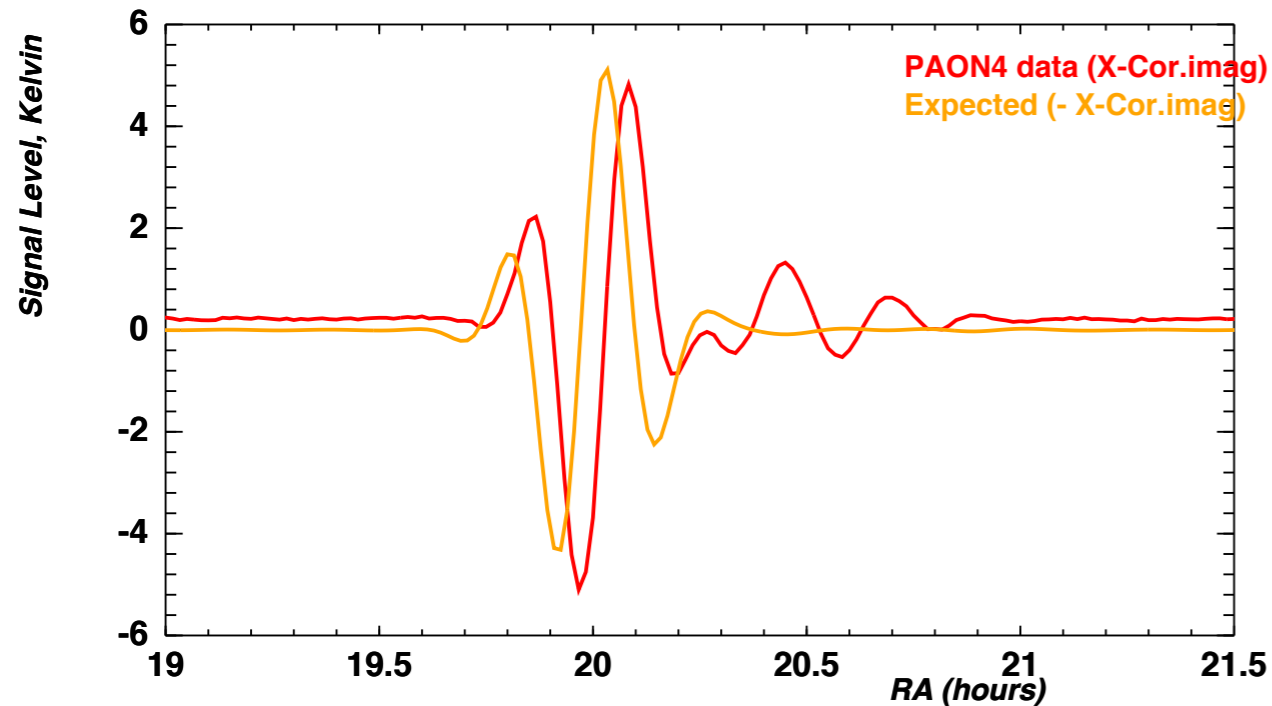


2H3H

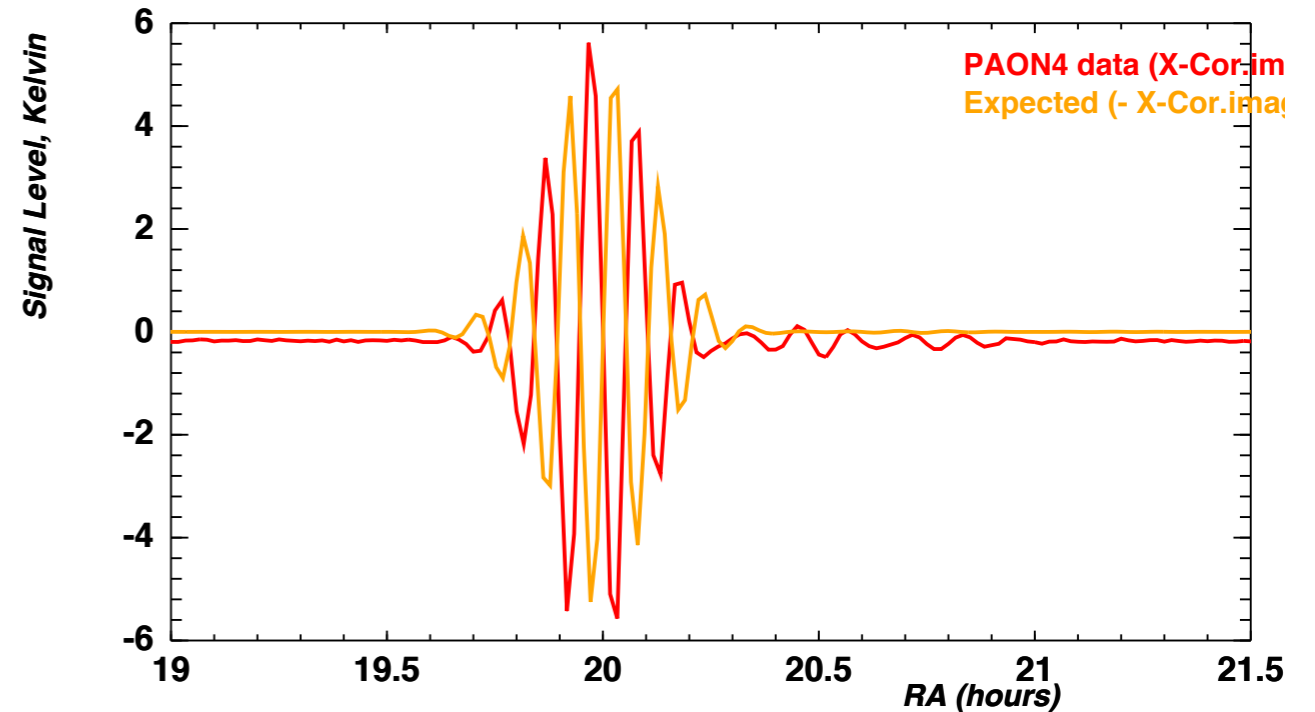
PAON4 A20 (elev=-6.6) and expected 2H3H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected 1H4H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected 2H3H @ 1390 MHz

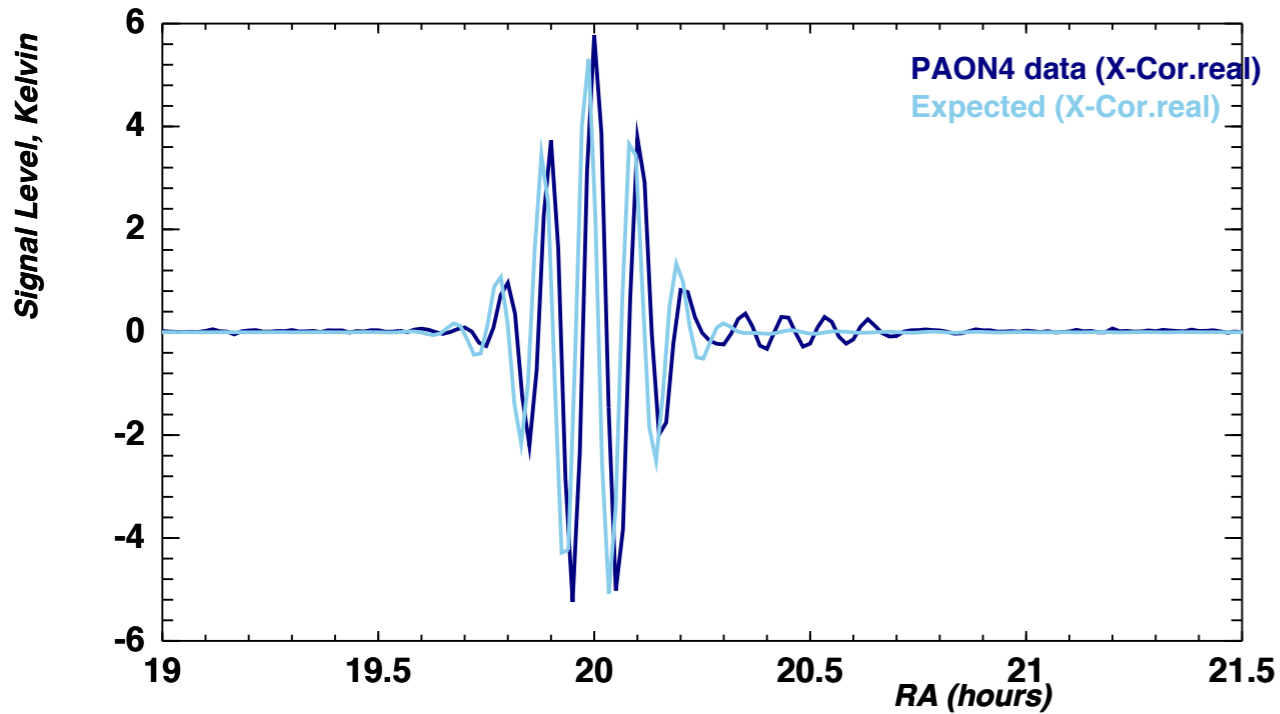


Scan A20 du 18/08 Elev=-6.6 - Declinaison de XCor @ 1395 MHz, autour de CygA

Configurations des phases pas tout à fait la même que A16 !

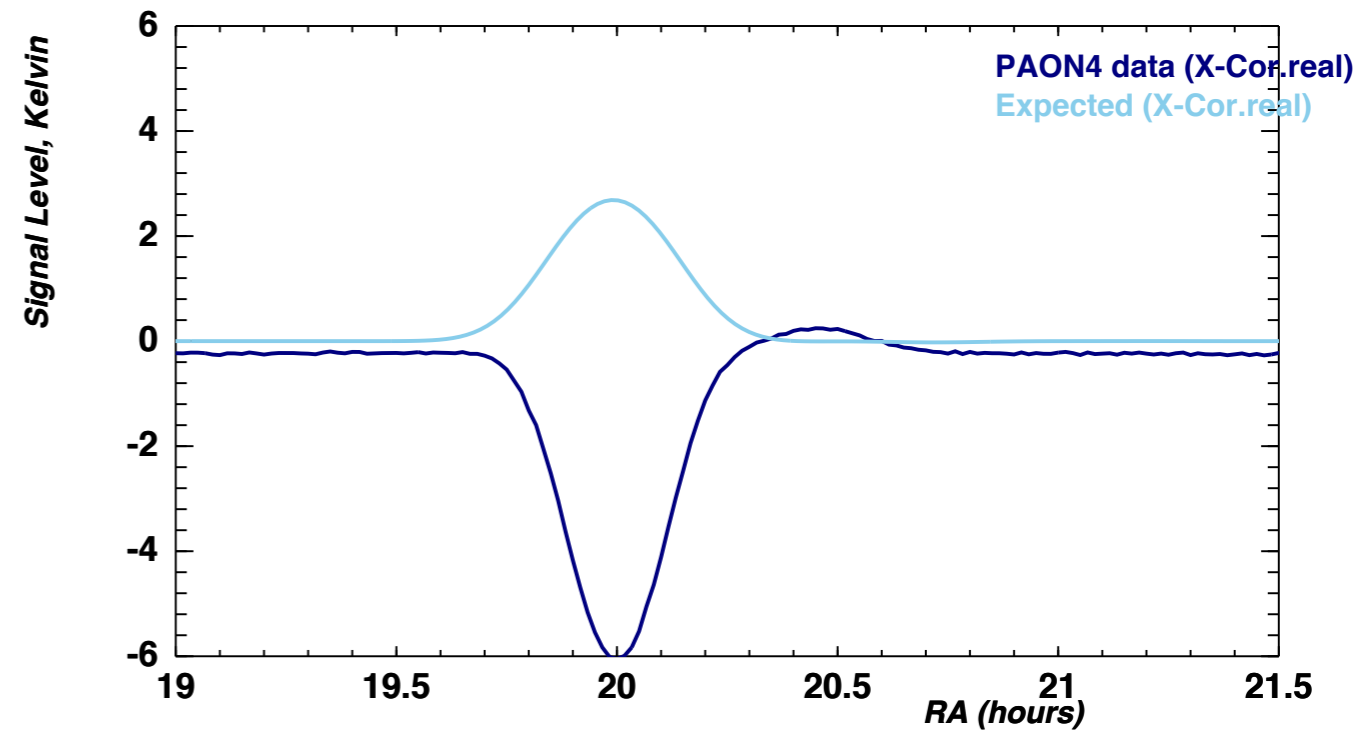
2H4H

PAON4 A20 (elev=-6.6) and expected 2H4H @ 1390 MHz

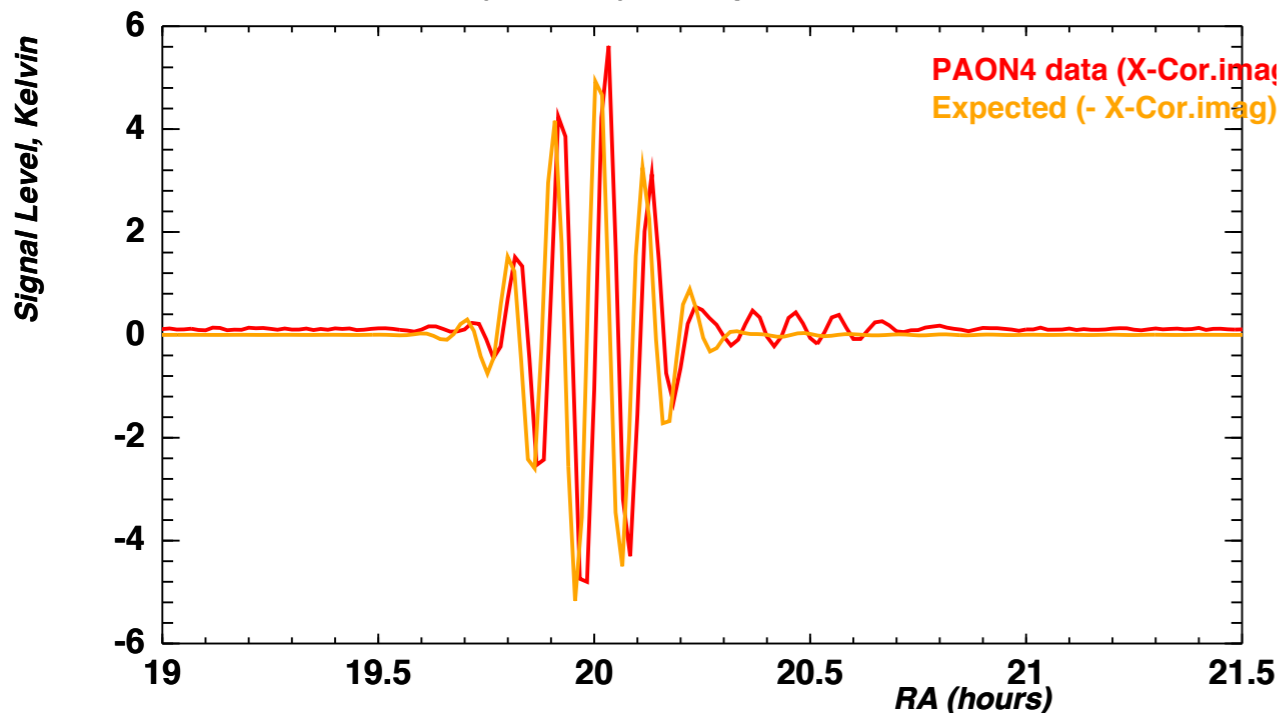


3H4H

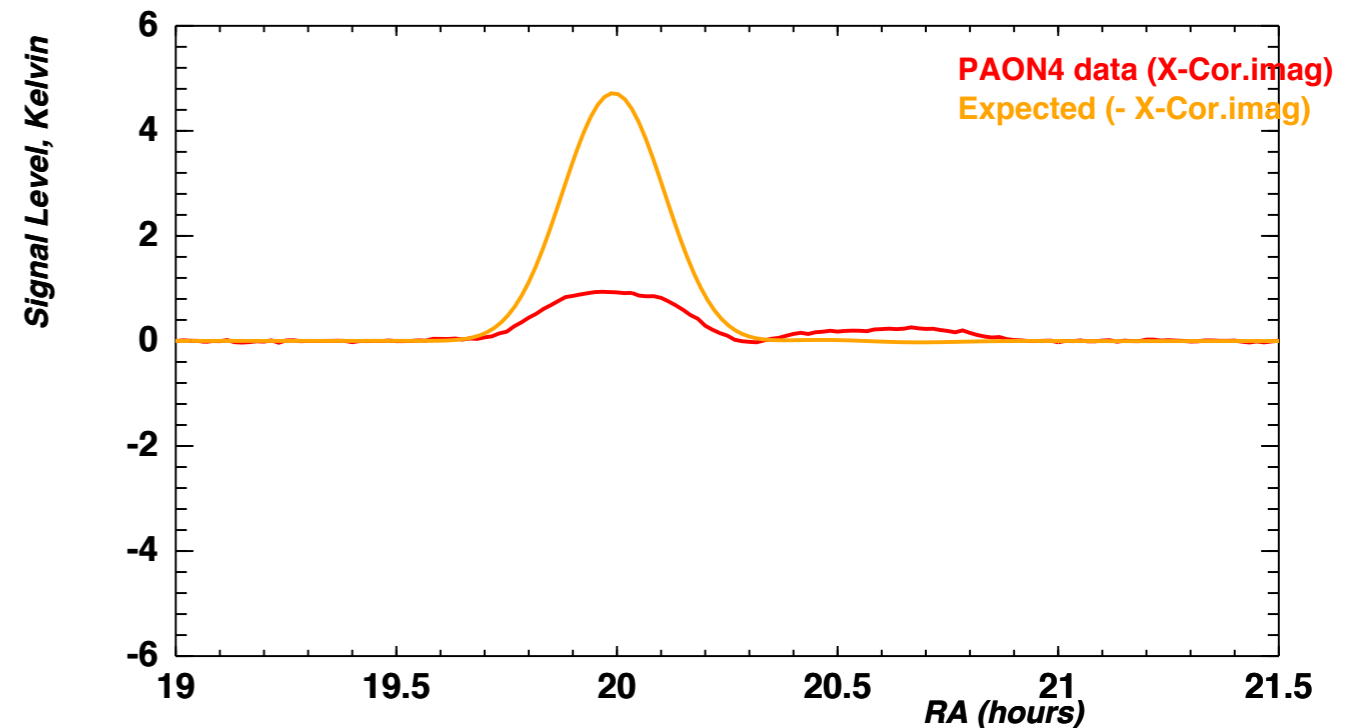
PAON4 A20 (elev=-6.6) and expected 3H4H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected 2H4H @ 1390 MHz



PAON4 A20 (elev=-6.6) and expected 3H4H @ 1390 MHz



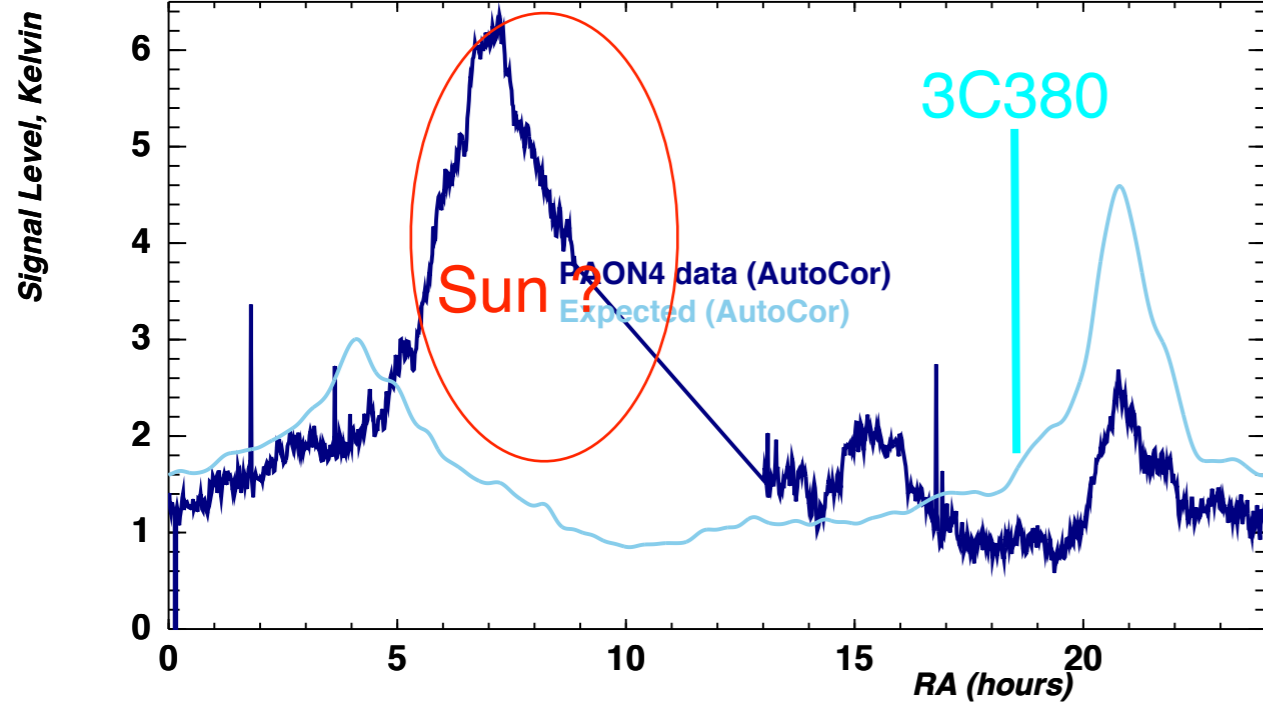
**Et les sources
plus faibles ?**

3C380
($\alpha=18^{\text{h}}29$, $\delta=48^{\text{d}}44'$)

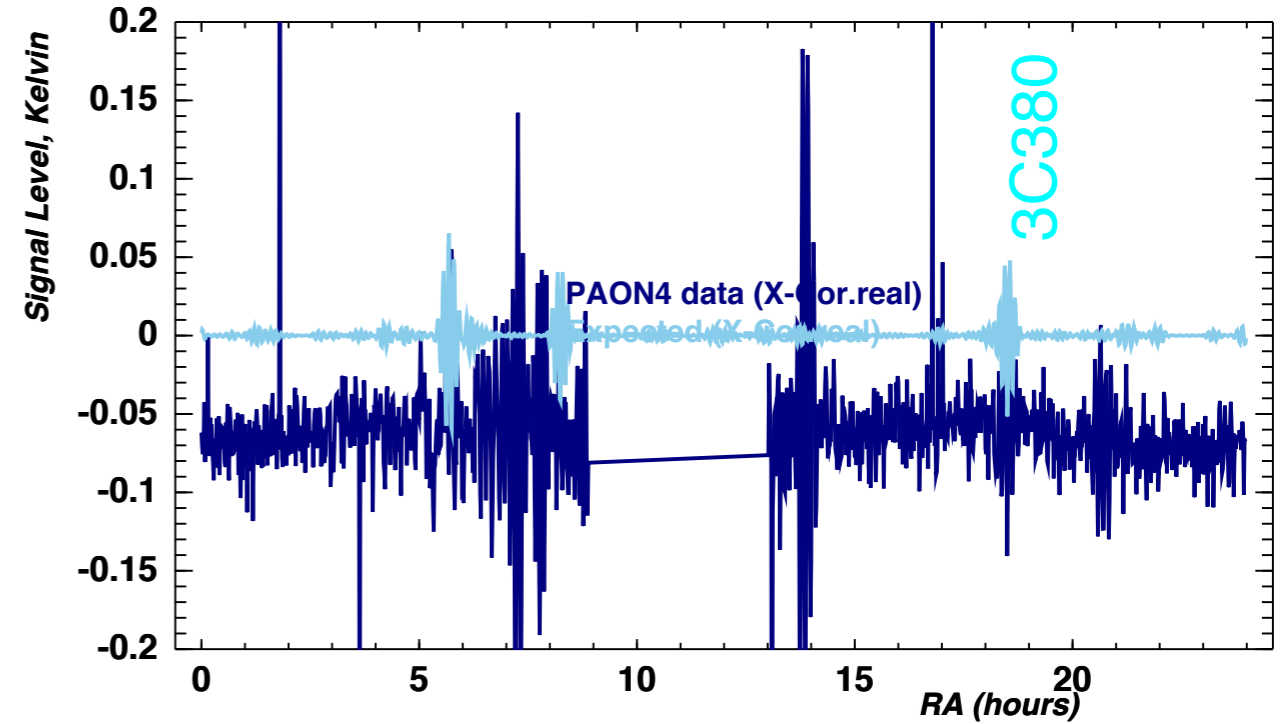
A10 du 03/08, Elev=1.4

Scan A10 du 03/08 Elev=1.4 - Proche de 3C380 ($\alpha=18h29$, $\delta=48d44$)

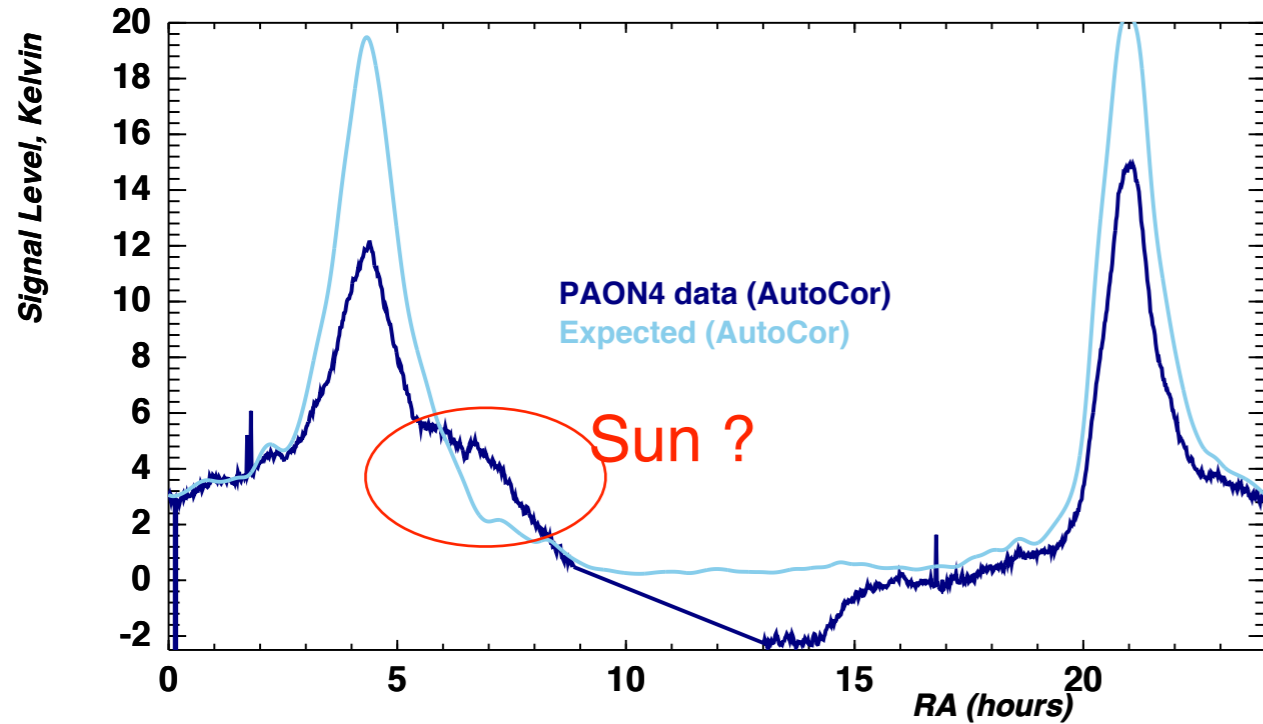
PAON4 A10 (elev=1.4) and expected AutoCor @ 1390 MHz



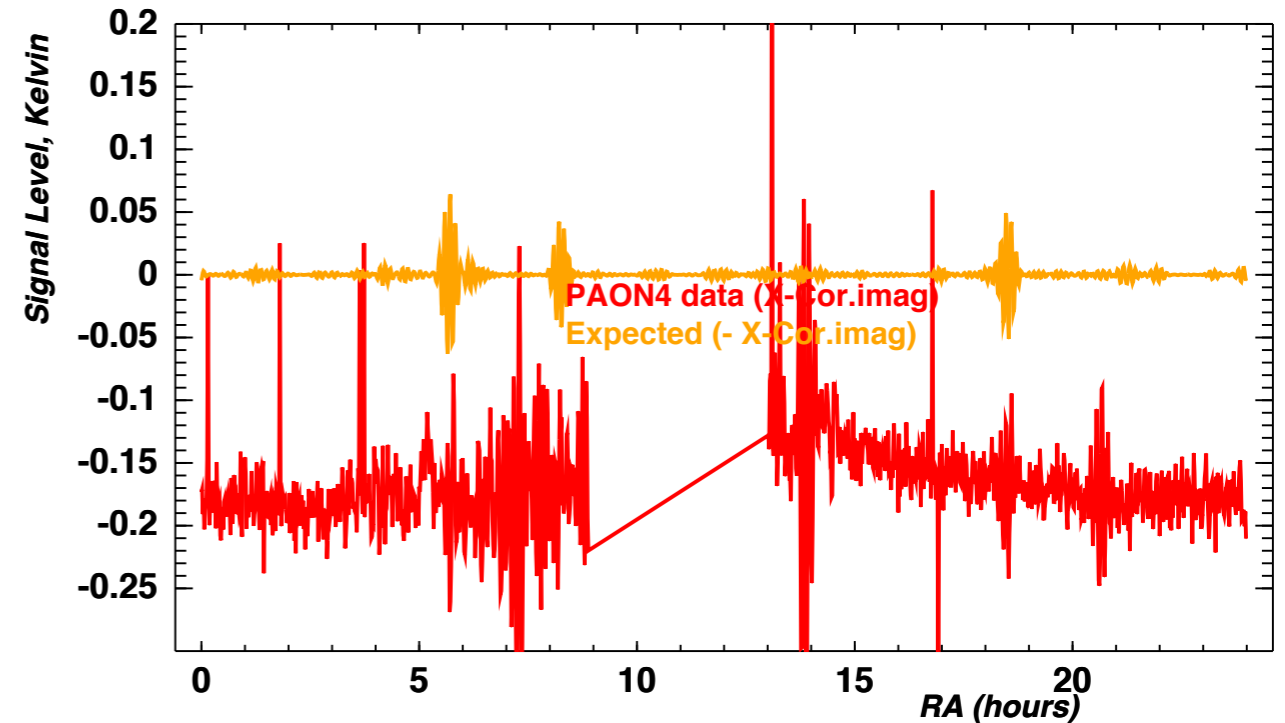
PAON4 A10 (elev=1.4) and expected 2H3H @ 1390 MHz



PAON4 A10 (elev=1.4) and expected AutoCor @ 1420 MHz



PAON4 A10 (elev=1.4) and expected 2H3H @ 1390 MHz



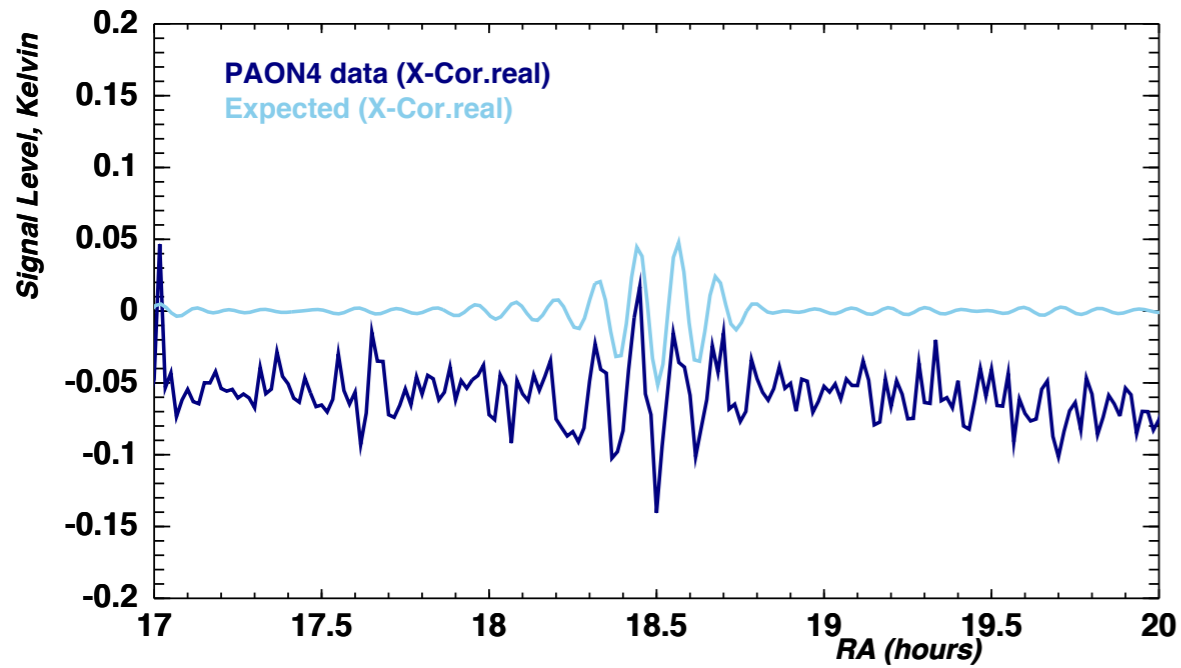
Auto-corrélation

Cross-Corr (real/imag) @ 1395 MHz

Scan A10 - Zoom sur CxCor @ 1395 MHz/ transit 3C380 ($\alpha=18^{\text{h}}29$, $\delta=48^{\text{d}}44$)

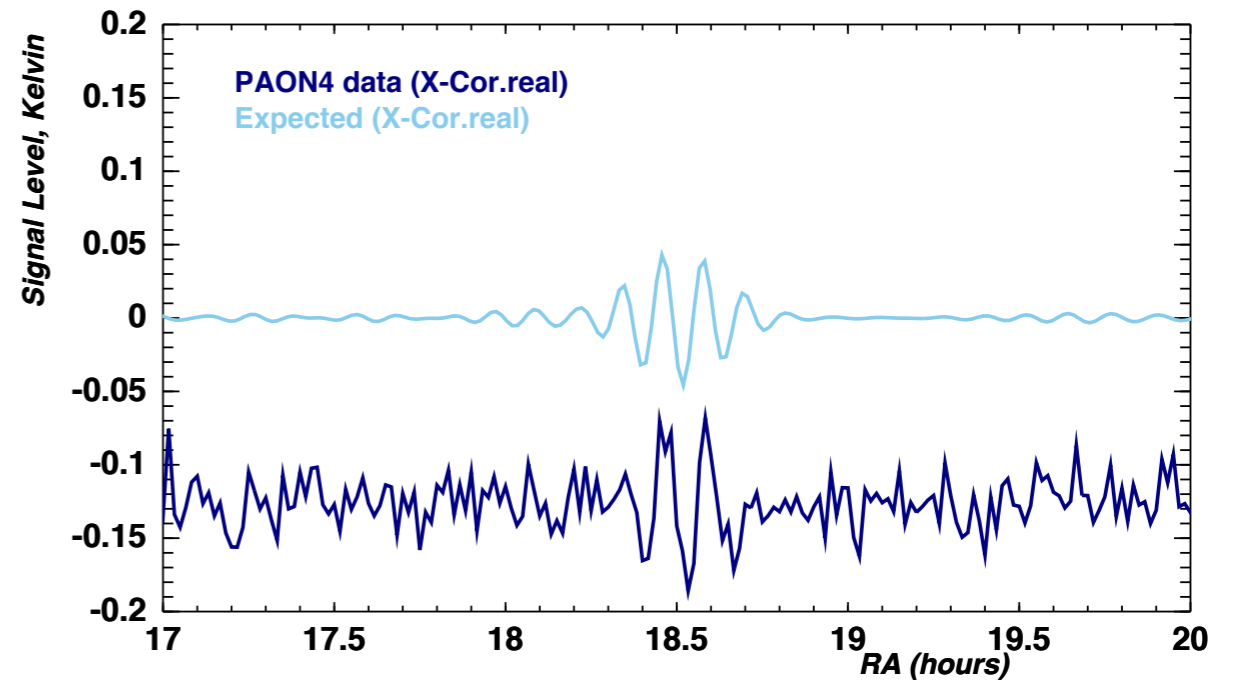
2H3H

PAON4 A10 (elev=1.4) and expected 2H3H @ 1390 MHz

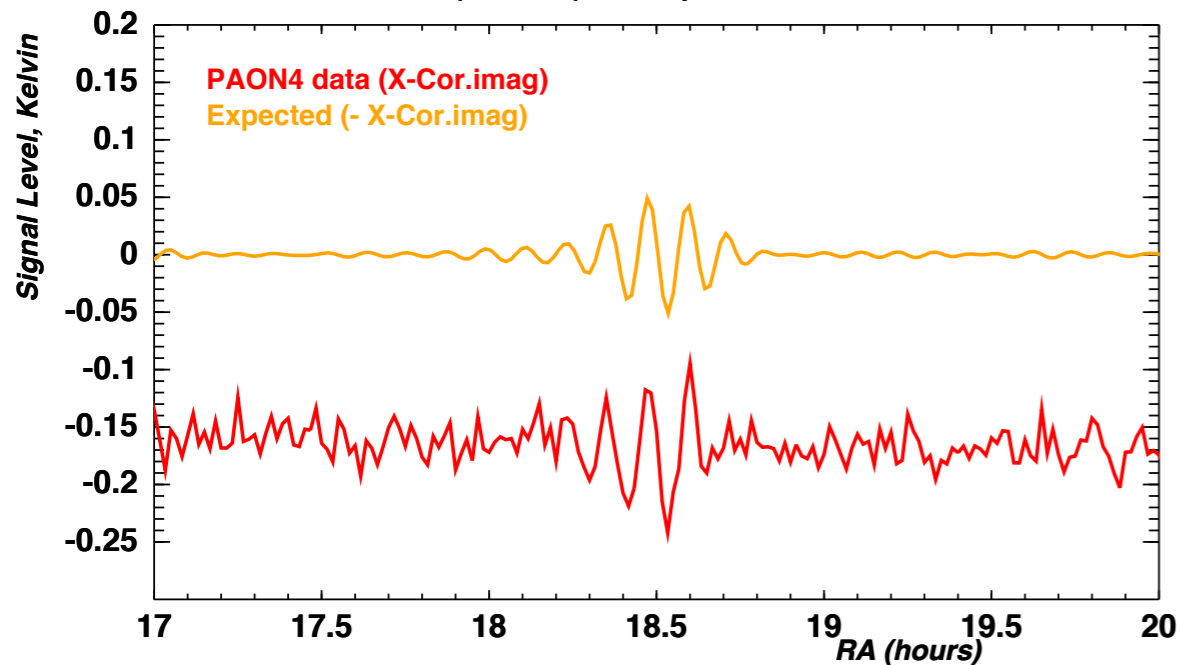


2H4H

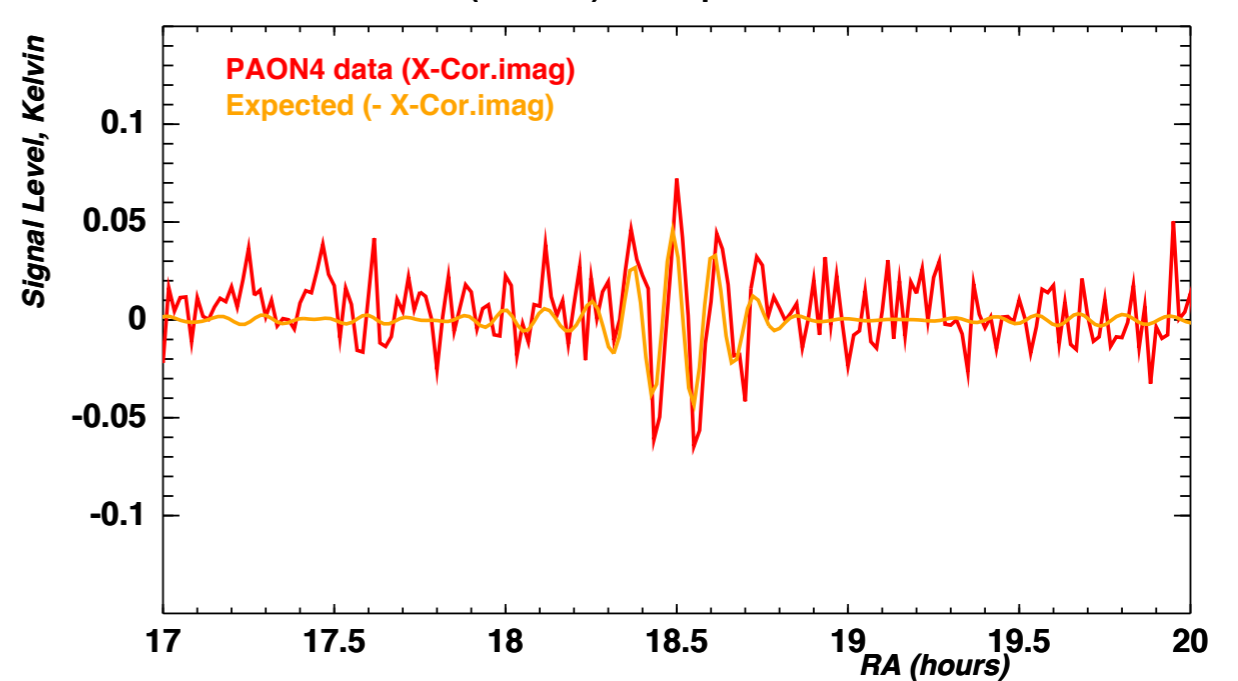
PAON4 A10 (elev=1.4) and expected 2H4H @ 1390 MHz



PAON4 A10 (elev=1.4) and expected 2H3H @ 1390 MHz

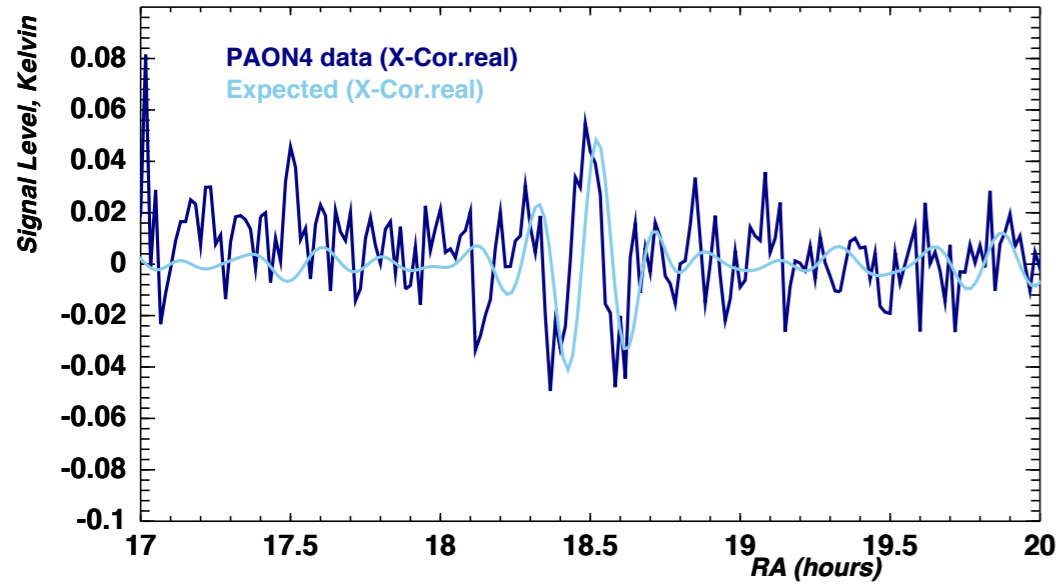


PAON4 A10 (elev=1.4) and expected 2H4H @ 1390 MHz

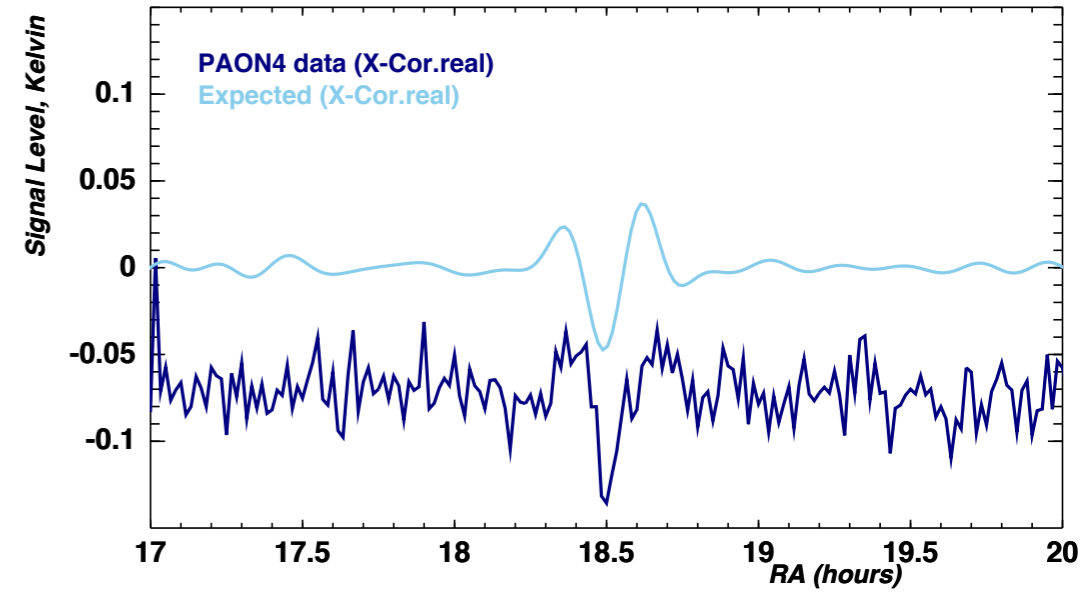


Scan A10 - Zoom sur CxCor @ 1395 MHz/ transit 3C380 ($\alpha=18h29$, $\delta=48d44$)

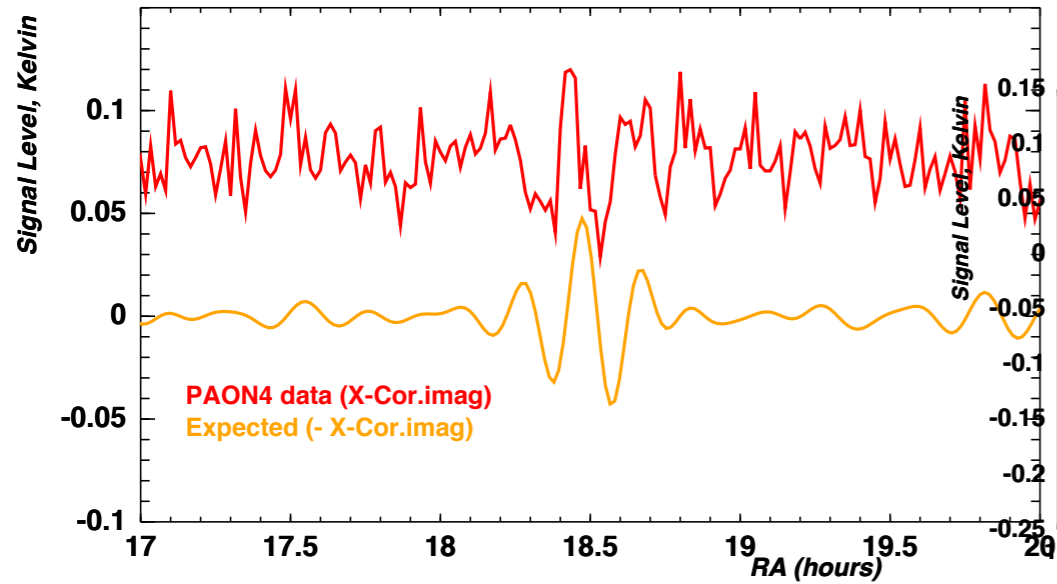
PAON4 A10 (elev=1.4) and expected 1H2H @ 1390 MHz



PAON4 A10 (elev=1.4) and expected 1H3H @ 1390 MHz

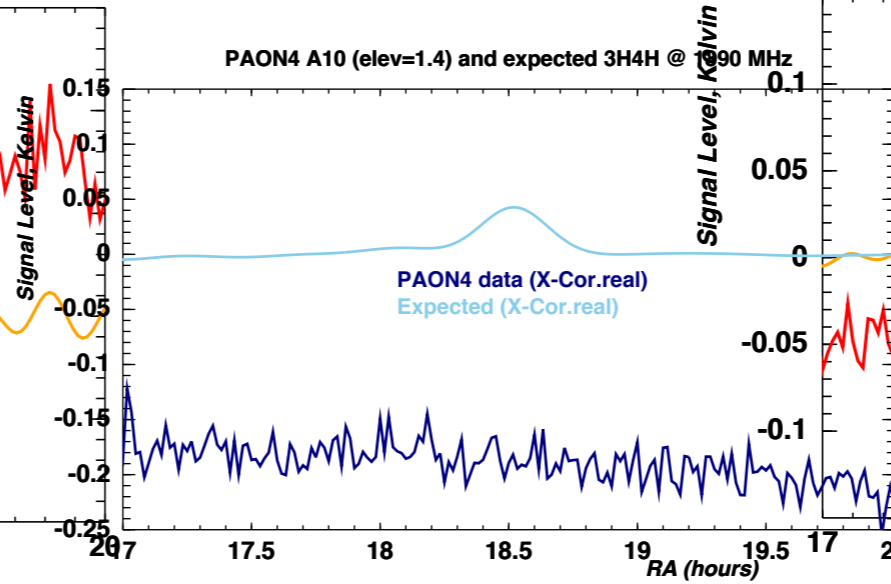


PAON4 A10 (elev=1.4) and expected 1H2H @ 1390 MHz

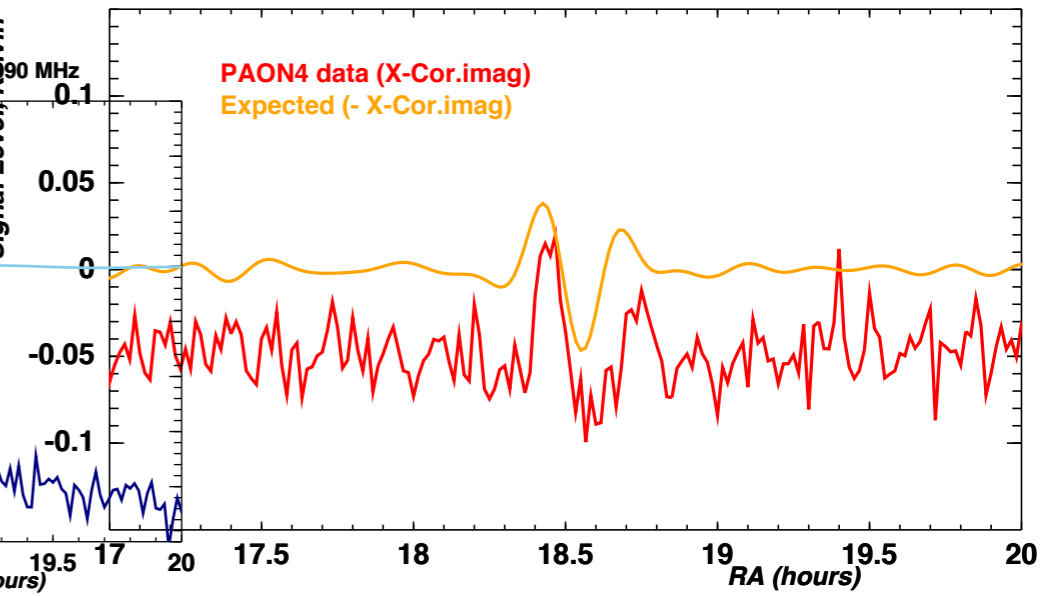


3H4H

PAON4 A10 (elev=1.4) and expected 3H4H @ 1390 MHz

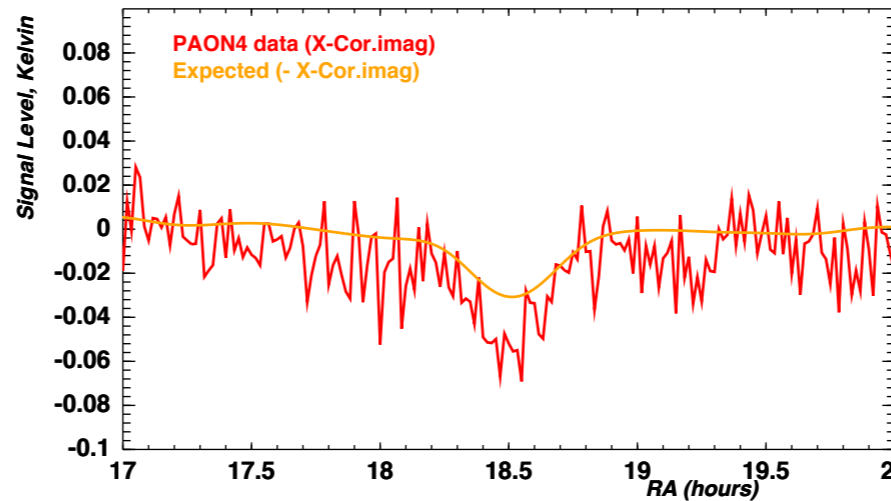


PAON4 A10 (elev=1.4) and expected 1H3H @ 1390 MHz



1H2H

PAON4 A10 (elev=1.4) and expected 3H4H @ 1390 MHz

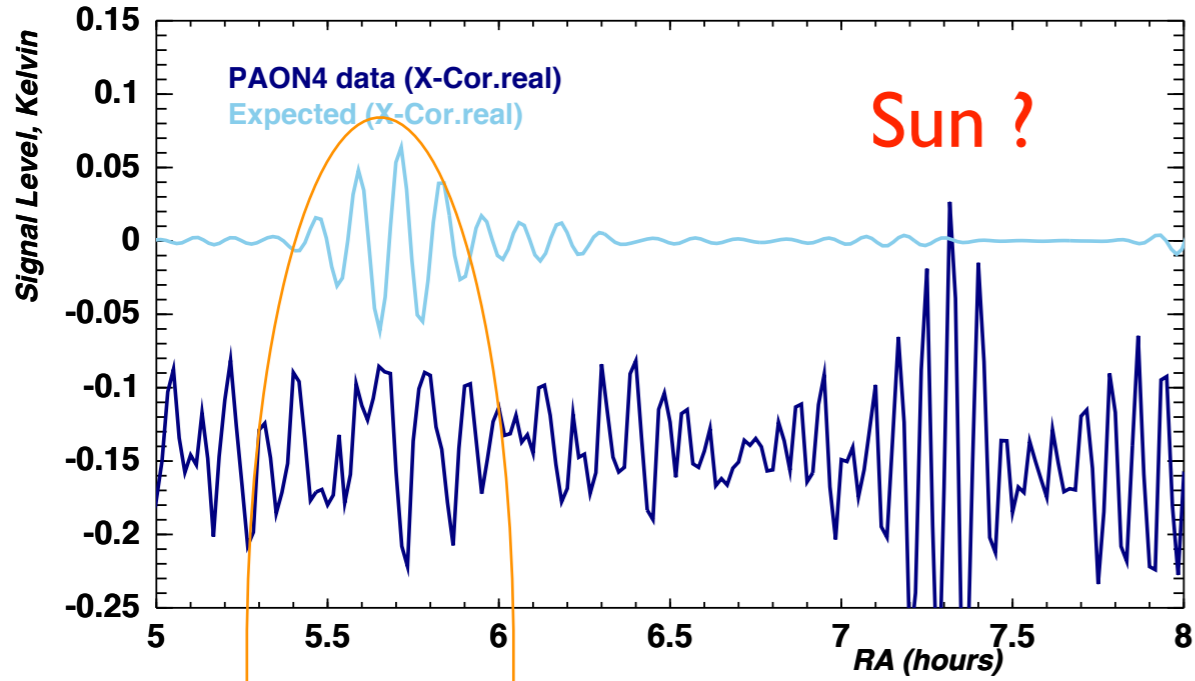


1H3H

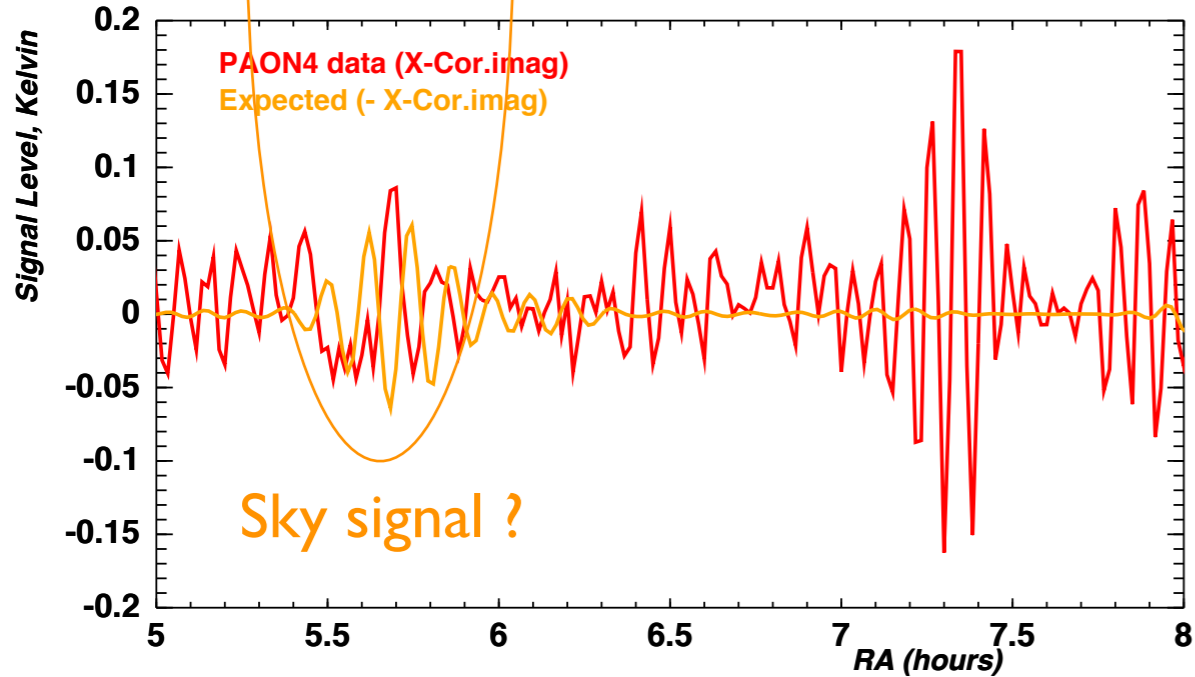
Scan A10 du 03/08 Elev=1.4 - @1395MHz Franges du soleil ?

2H4H

PAON4 A10 (elev=1.4) and expected 2H4H @ 1390 MHz

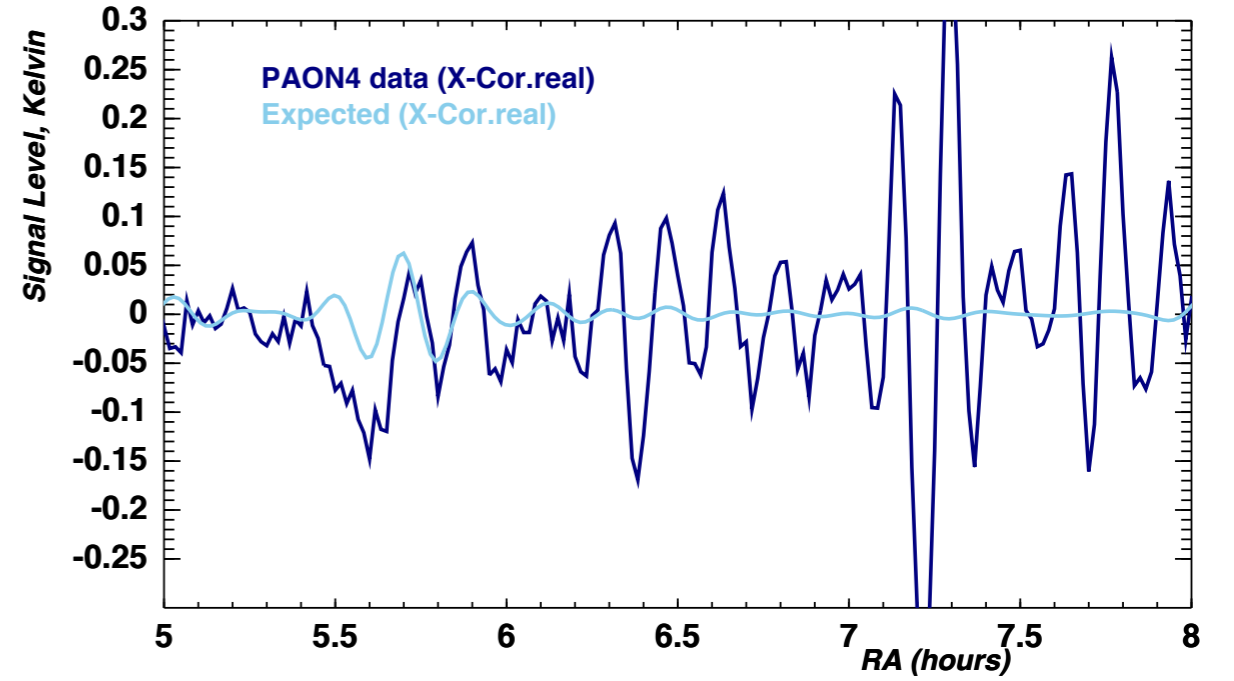


PAON4 A10 (elev=1.4) and expected 2H4H @ 1390 MHz

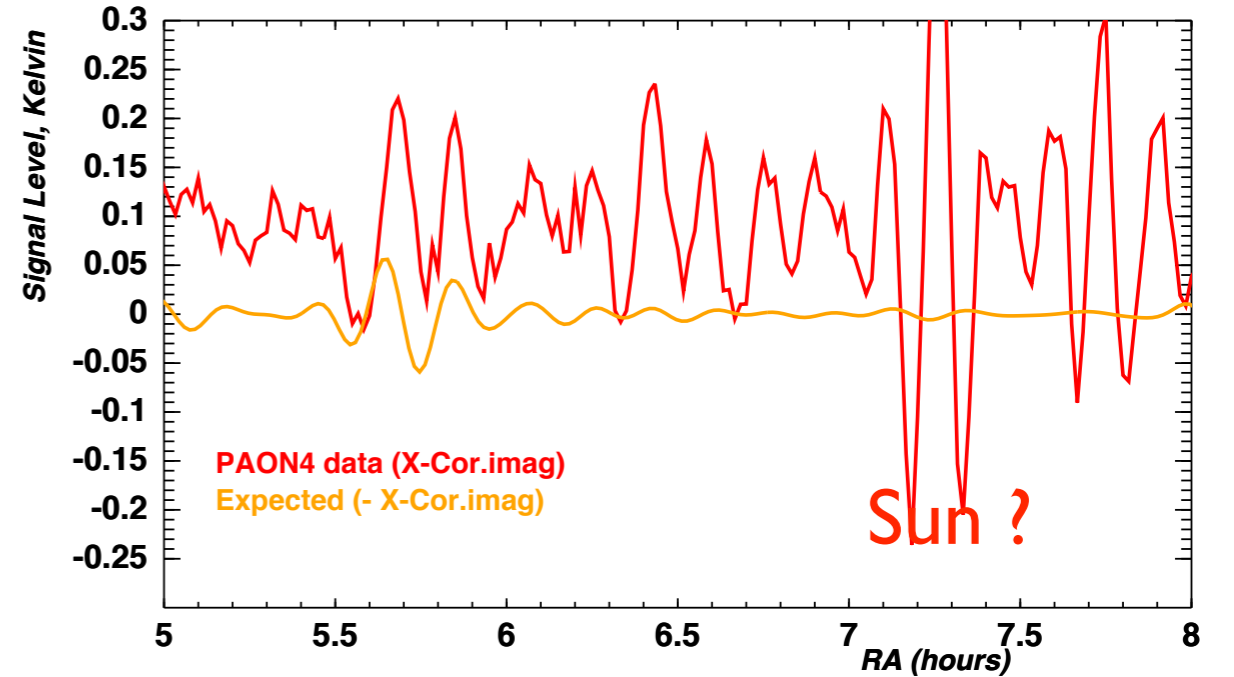


1H2H

PAON4 A10 (elev=1.4) and expected 1H2H @ 1390 MHz



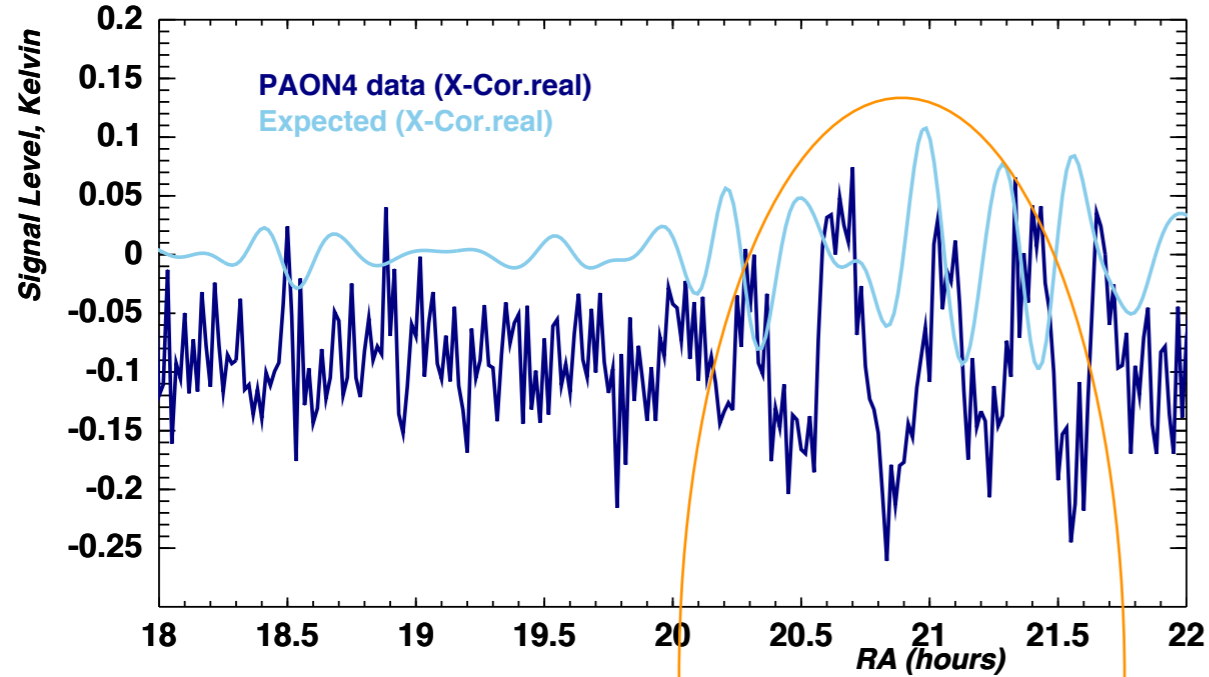
PAON4 A10 (elev=1.4) and expected 1H2H @ 1390 MHz



Scan A10 du 03/08 Elev=1.4 -@1420MHz, HI signal ?

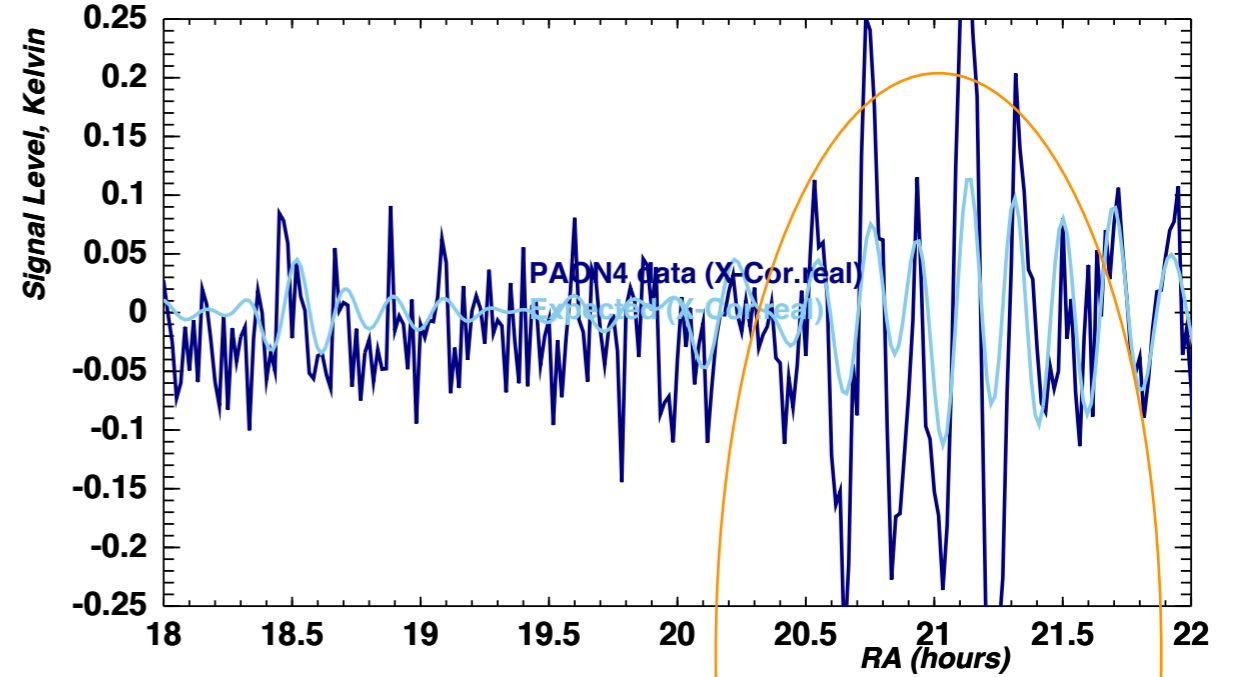
IH4H

PAON4 A10 (elev=1.4) and expected IH4H @ 1420 MHz

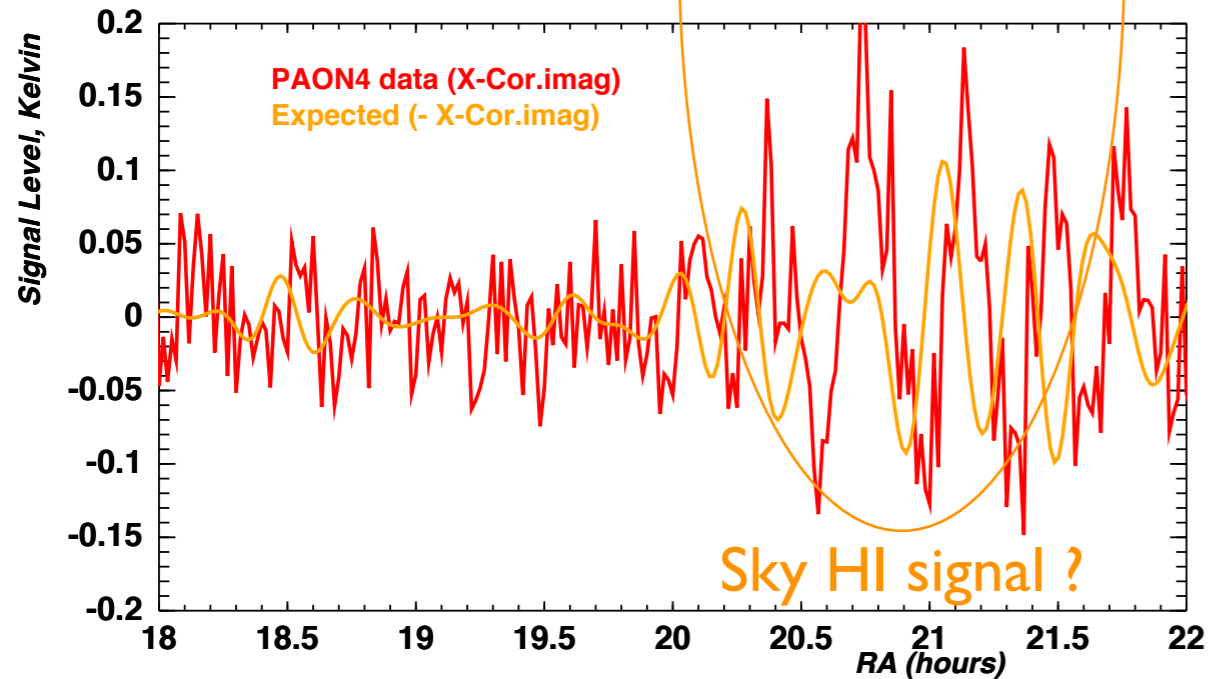


IH2H

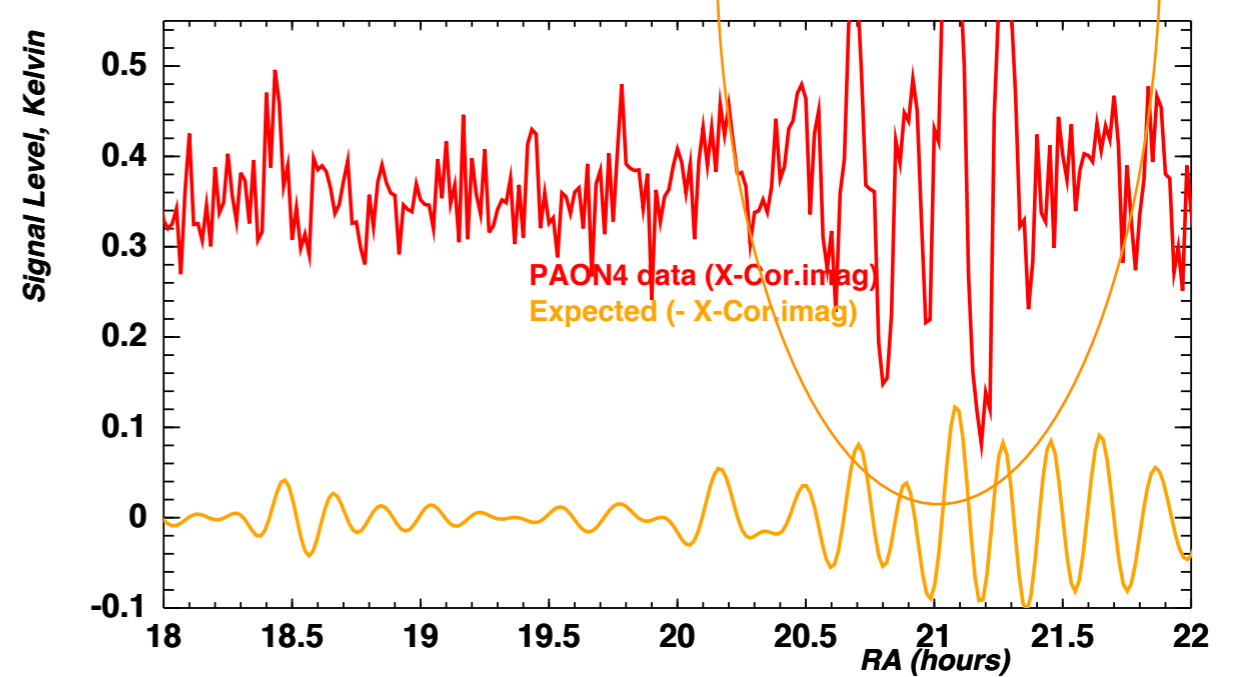
PAON4 A10 (elev=1.4) and expected IH2H @ 1420 MHz



PAON4 A10 (elev=1.4) and expected IH4H @ 1420 MHz



PAON4 A10 (elev=1.4) and expected IH2H @ 1420 MHz



Sky HI signal ?

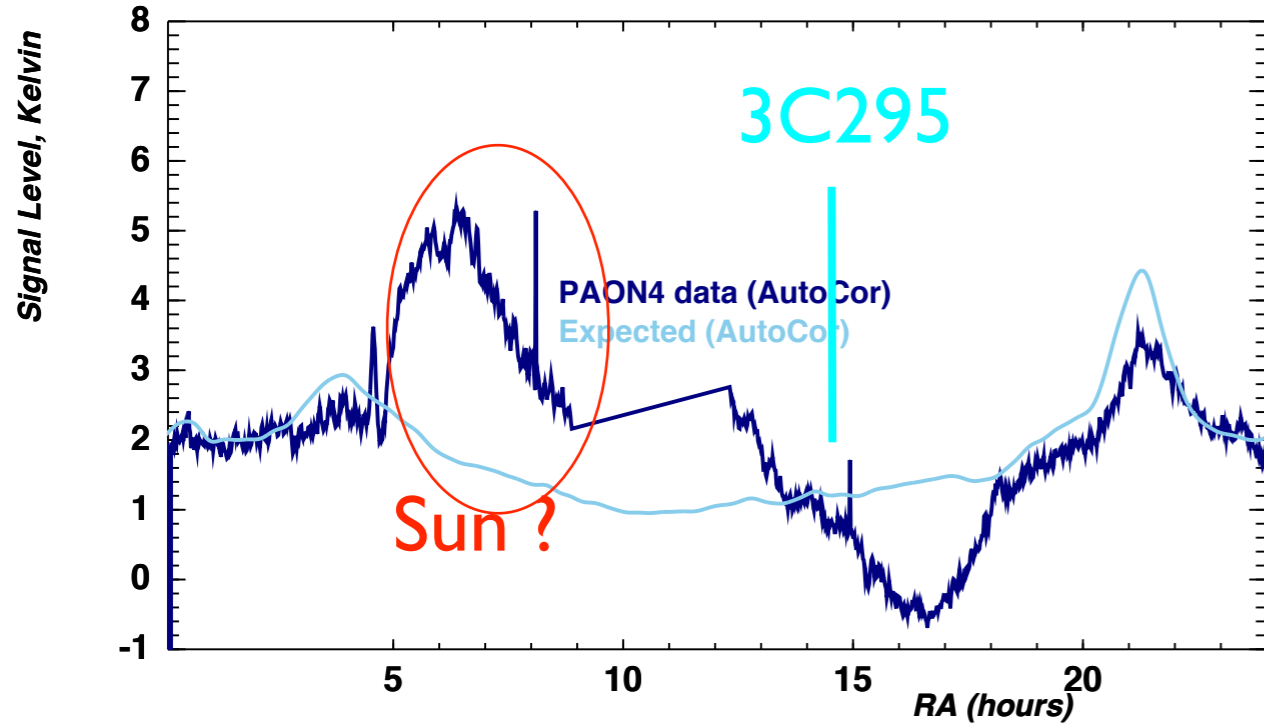
3C295
($\alpha=14^{\text{h}}11$, $\delta=52^{\text{d}}12'$)

A05 Elev=5.4 A06 Elev=4.4

Scans A05 Elev=5.4 (22/07) A06 Elev=4.4 du 23/07
Proche de 3C295 ($\alpha=14h11, \delta=52d12'$)

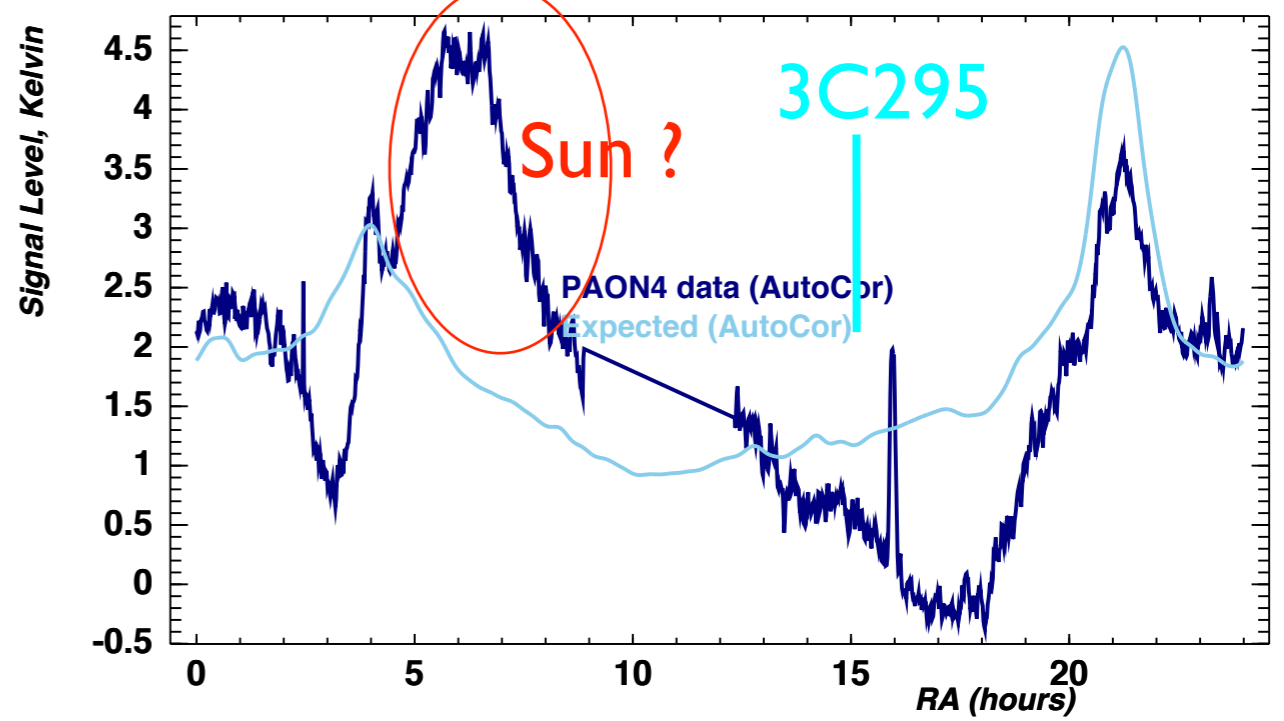
A05

PAON4 A05 (elev=5.4) and expected AutoCor @ 1390 MHz

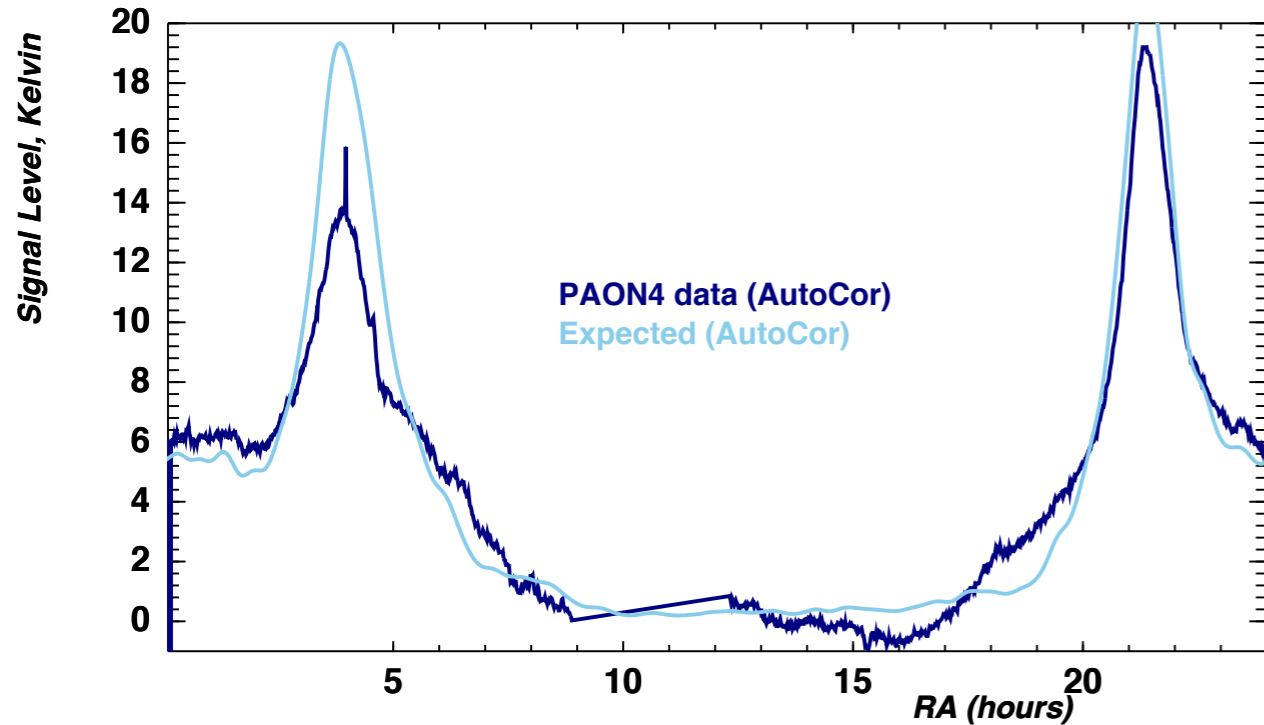


A06

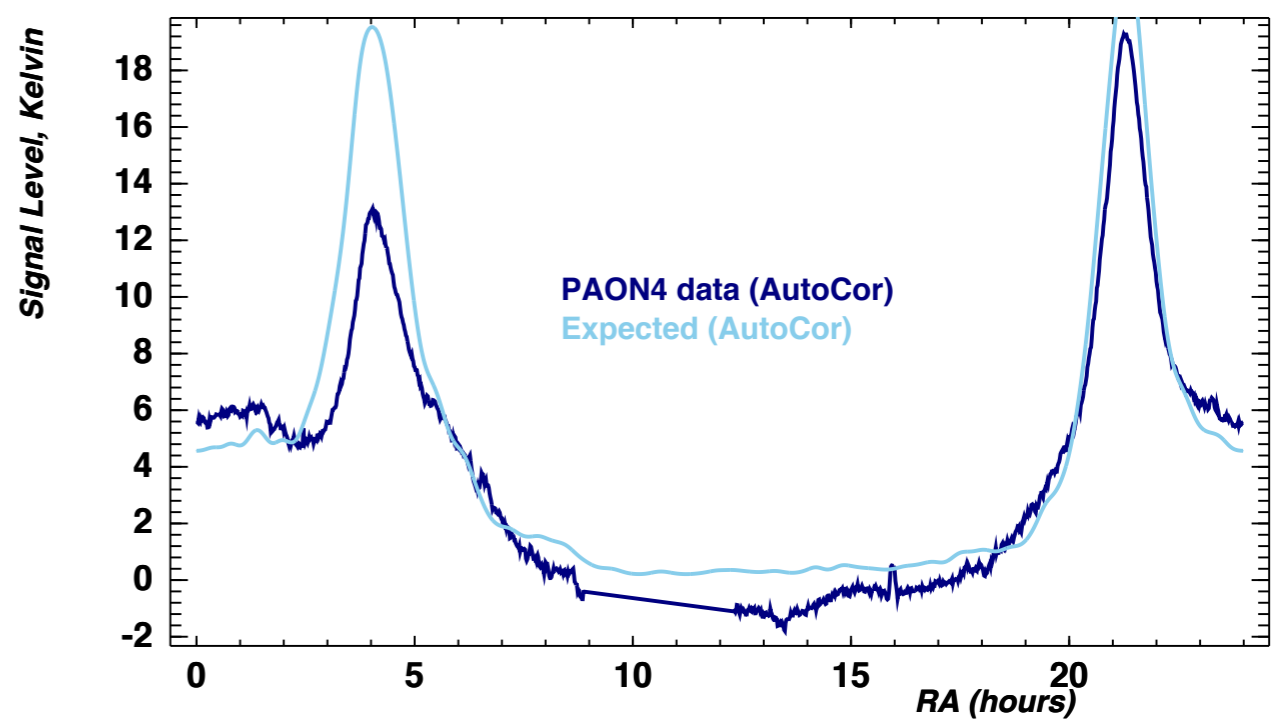
PAON4 A06 (elev=4.4) and expected AutoCor @ 1390 MHz



PAON4 A05 (elev=5.4) and expected AutoCor @ 1420 MHz



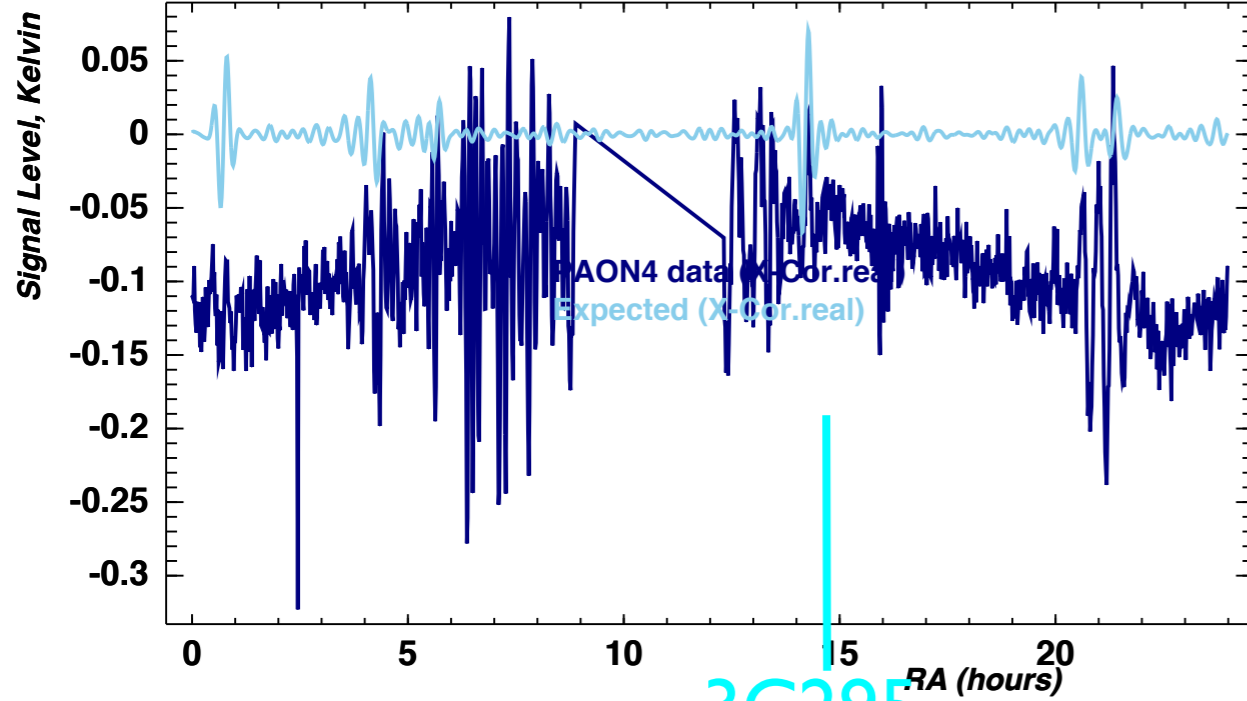
PAON4 A06 (elev=4.4) and expected AutoCor @ 1420 MHz



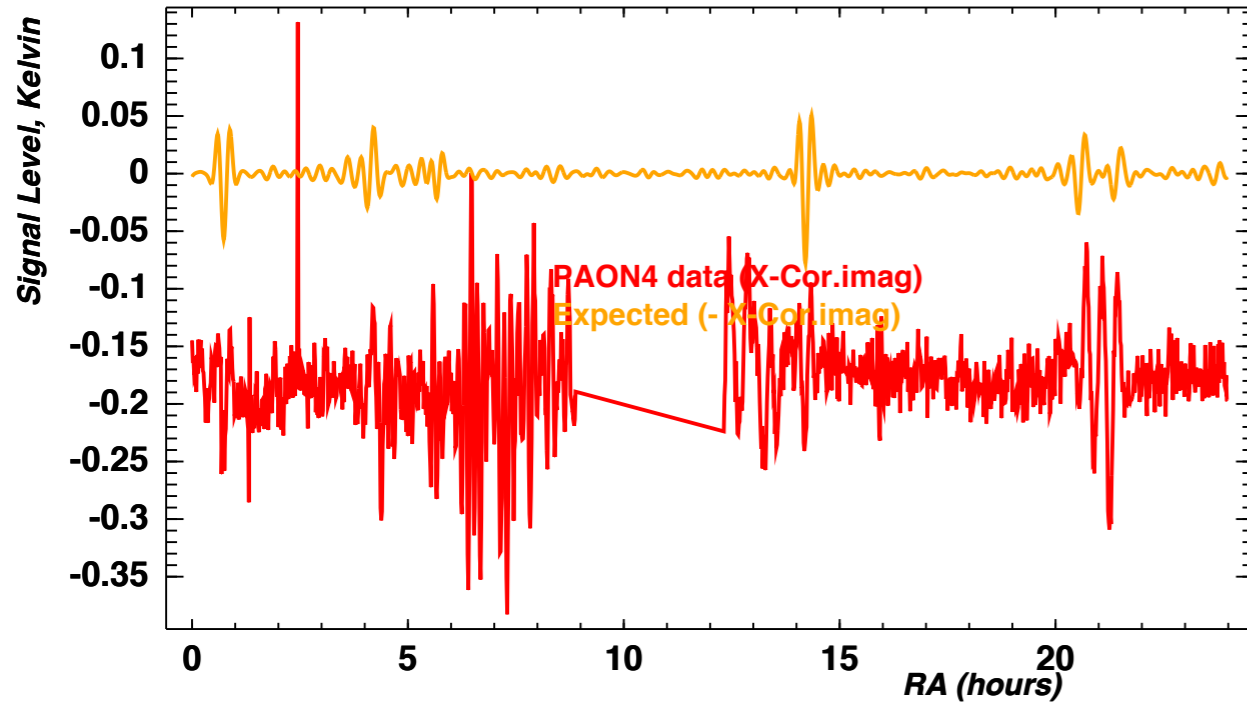
Scans A05 Elev=5.4 (22/07) A06 Elev=4.4 du 23/07 Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

A05

PAON4 A06 (elev=4.4) and expected 1H4H @ 1390 MHz

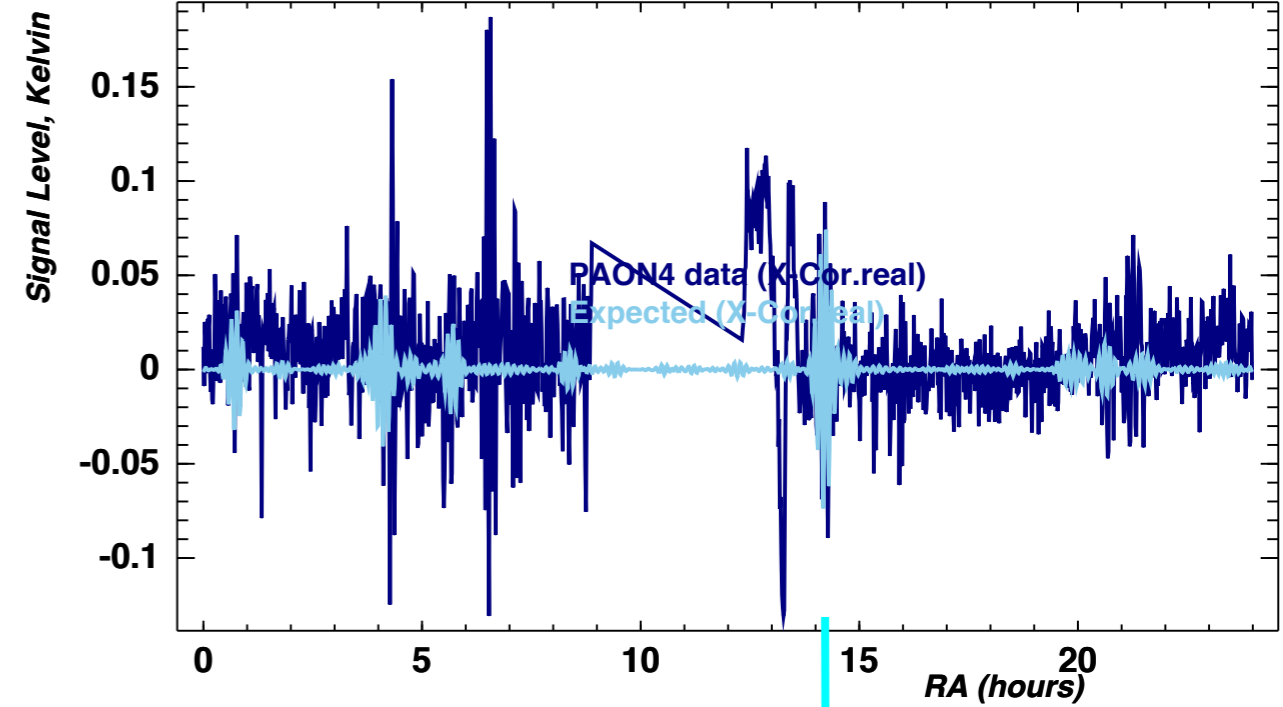


PAON4 A06 (elev=4.4) and expected 1H4H @ 1390 MHz

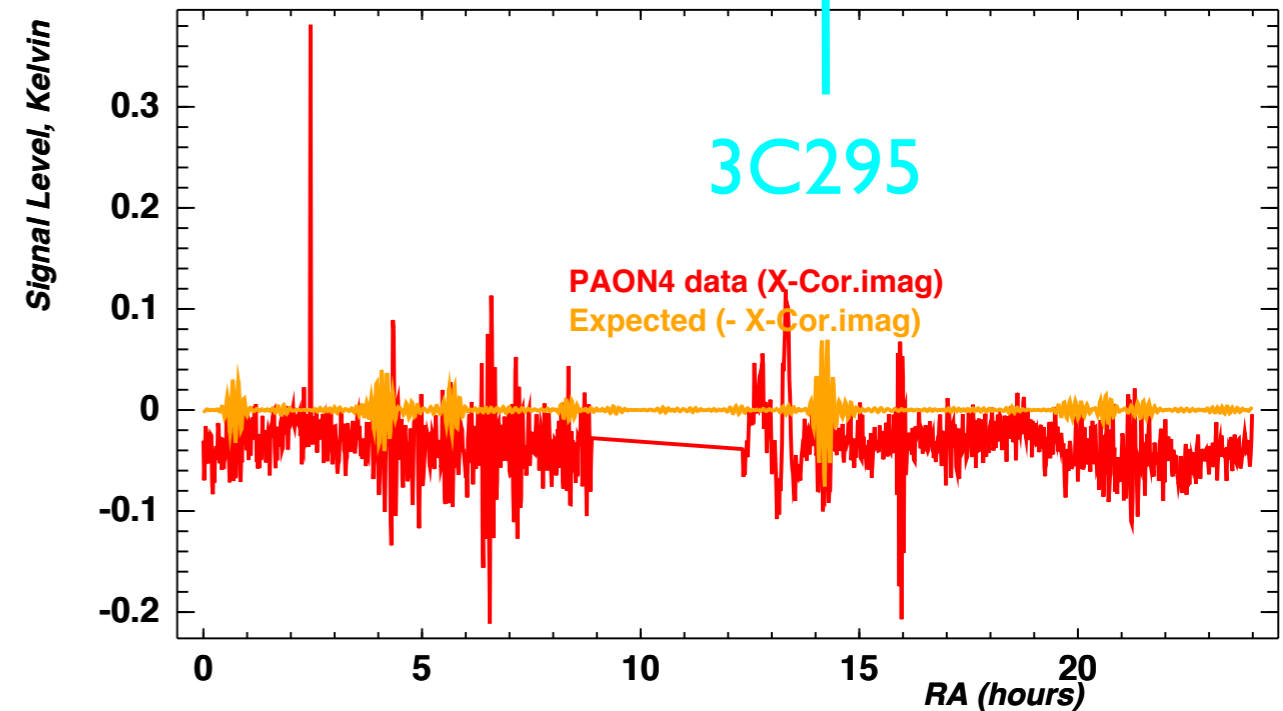


A06

PAON4 A06 (elev=4.4) and expected 2H4H @ 1390 MHz



PAON4 A06 (elev=4.4) and expected 2H4H @ 1390 MHz



Scans A06 Elev=4.4 du 23/07 @1395 MHz

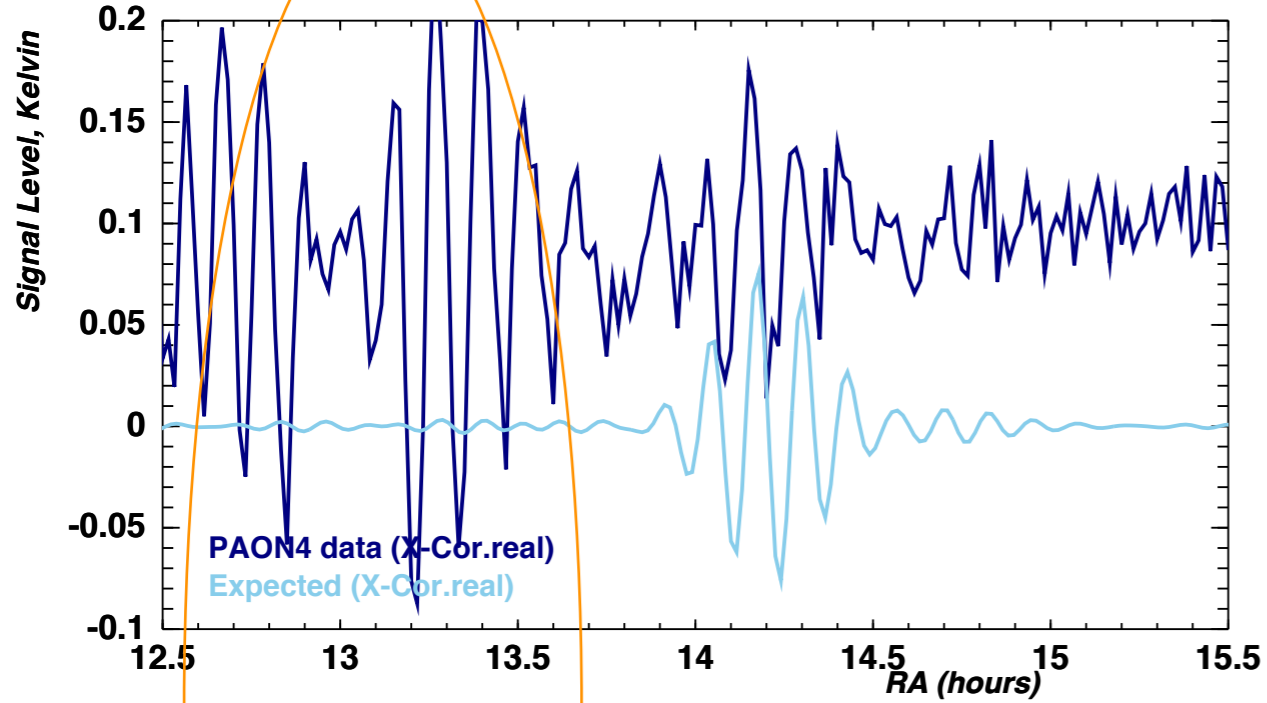
Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

2H3H

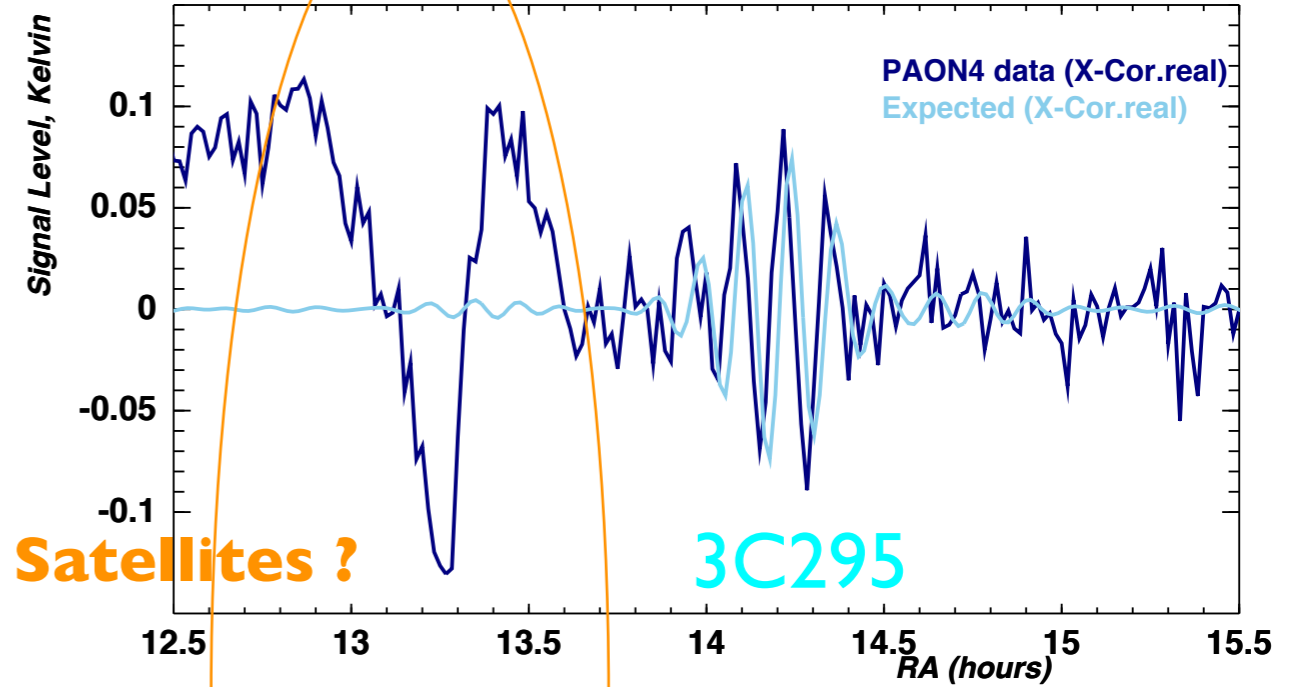
2H4H

Satellites ?

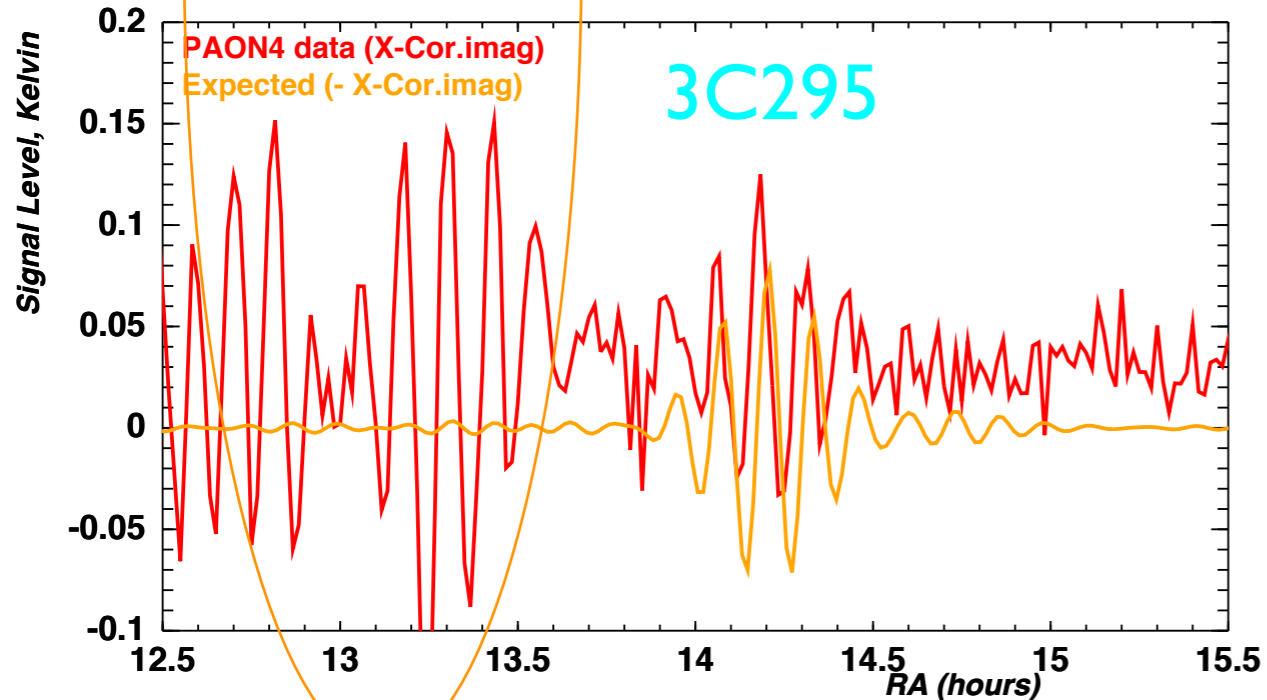
PAON4 A06 (elev=4.4) and expected 2H3H @ 1390 MHz



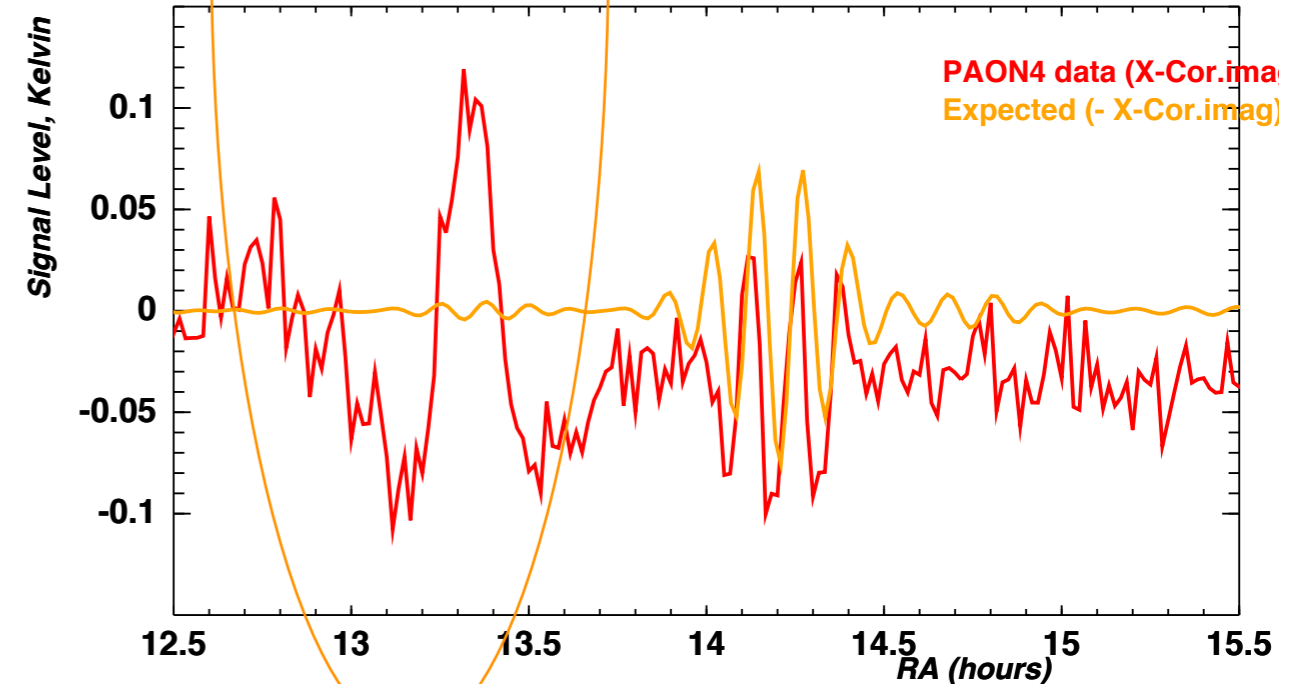
PAON4 A06 (elev=4.4) and expected 2H4H @ 1390 MHz



PAON4 A06 (elev=4.4) and expected 2H3H @ 1390 MHz



PAON4 A06 (elev=4.4) and expected 2H4H @ 1390 MHz

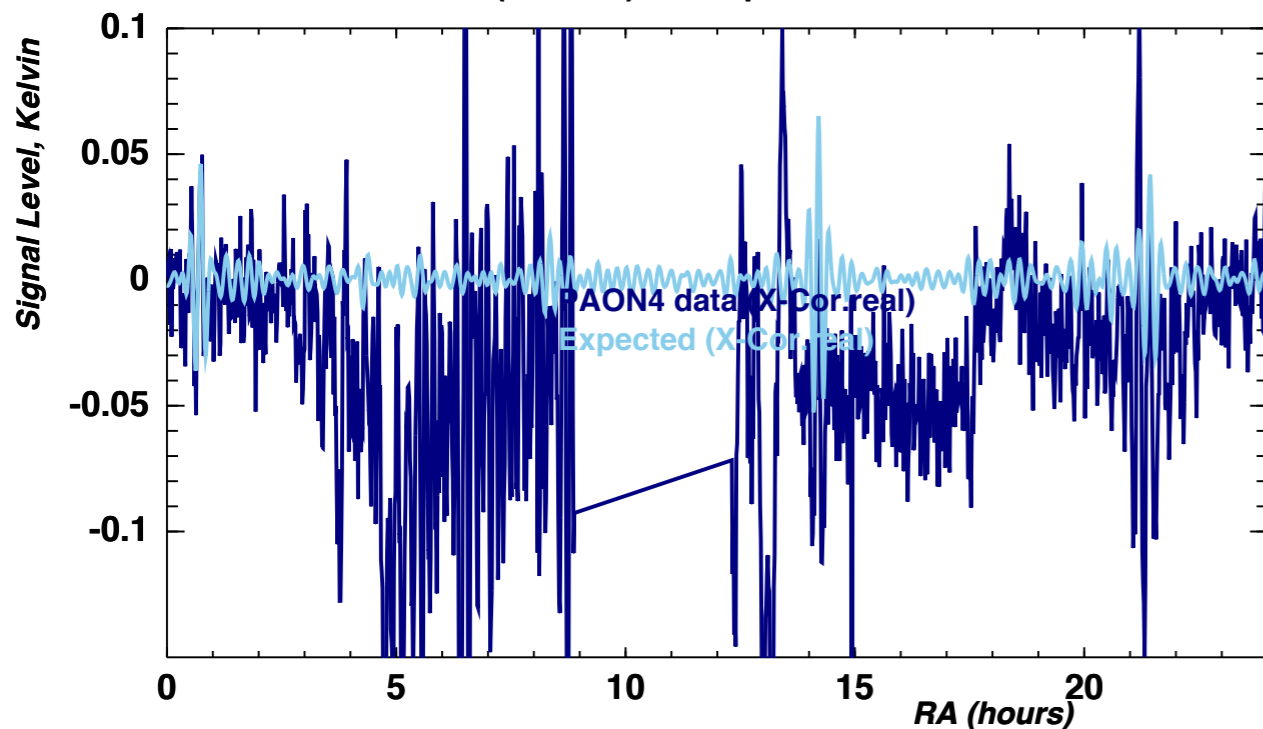


Scans A05 Elev=5.4 du 22/07 @ 1395 MHz

Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

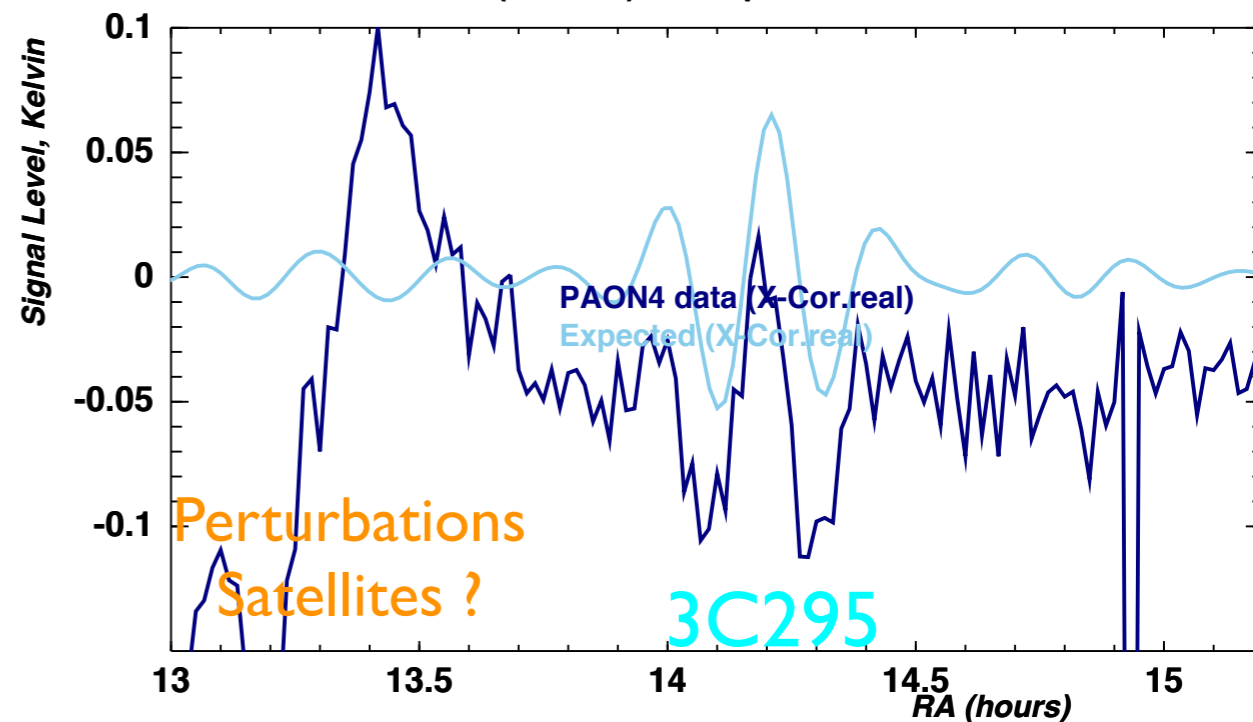
IH2H

PAON4 A05 (elev=5.4) and expected 1H2H @ 1390 MHz

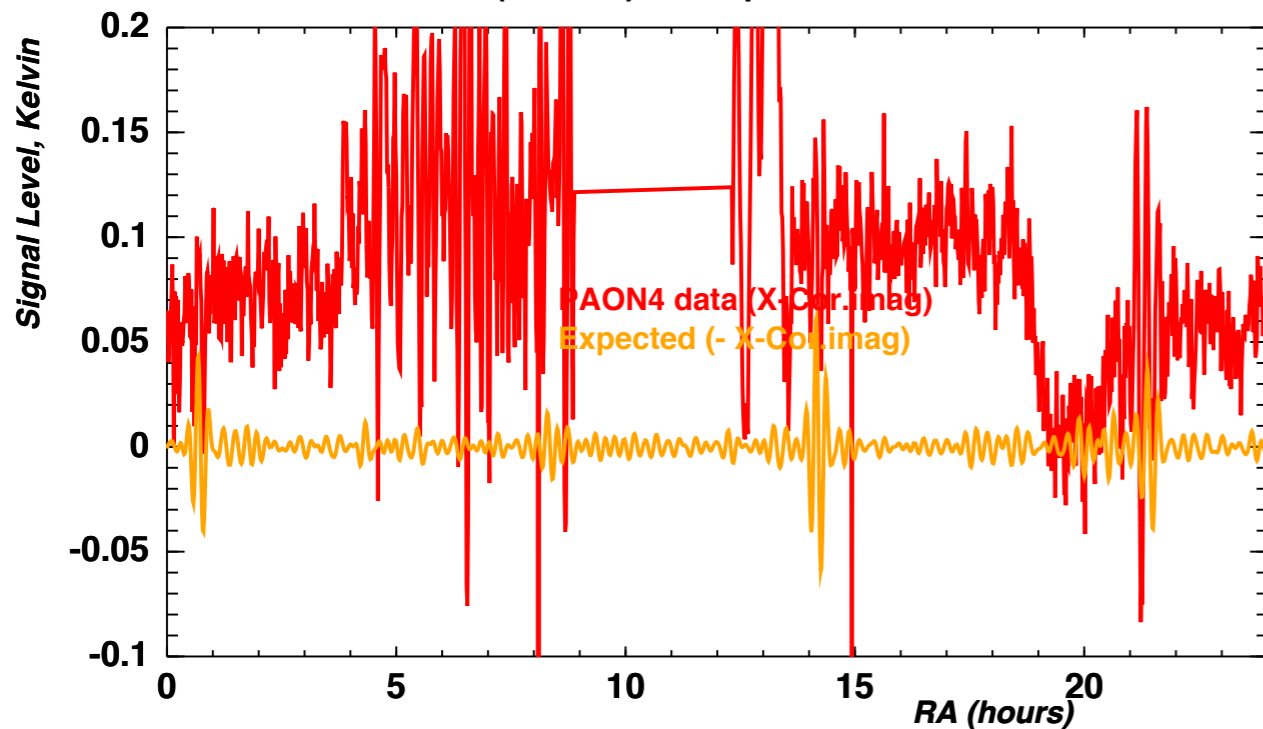


IH2H - zoom sur 3C295

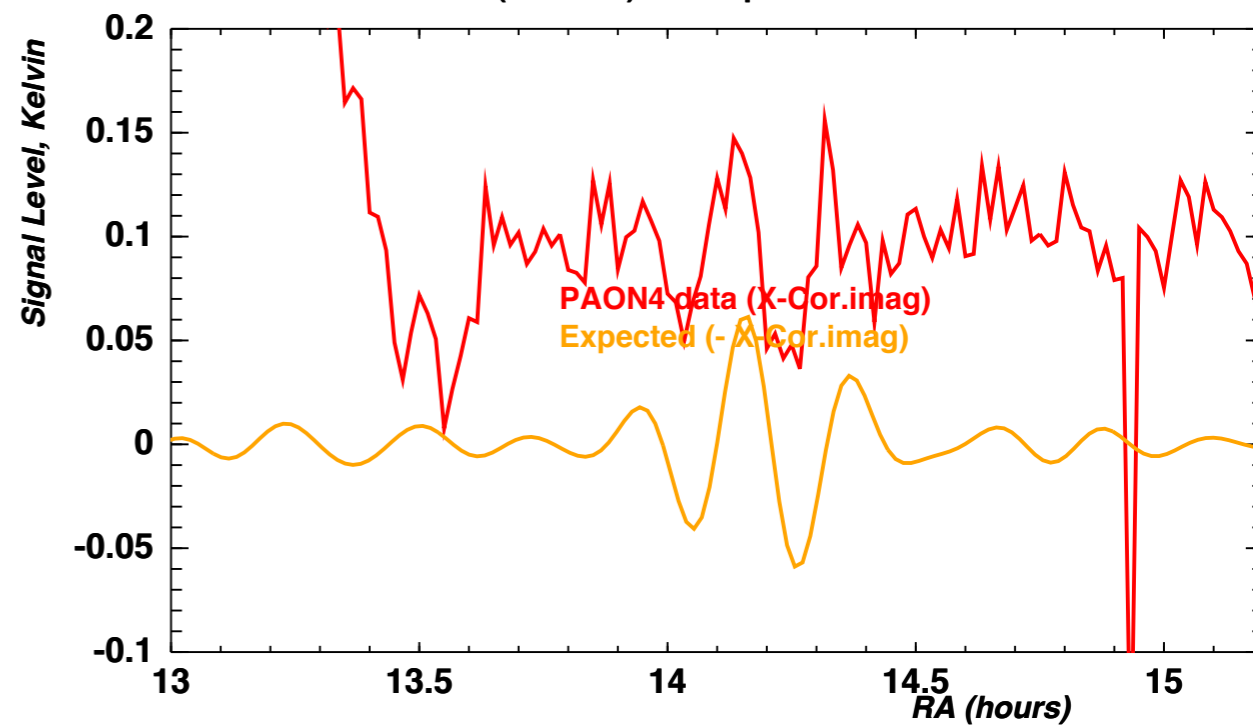
PAON4 A05 (elev=5.4) and expected 1H2H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected 1H2H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected 1H2H @ 1390 MHz

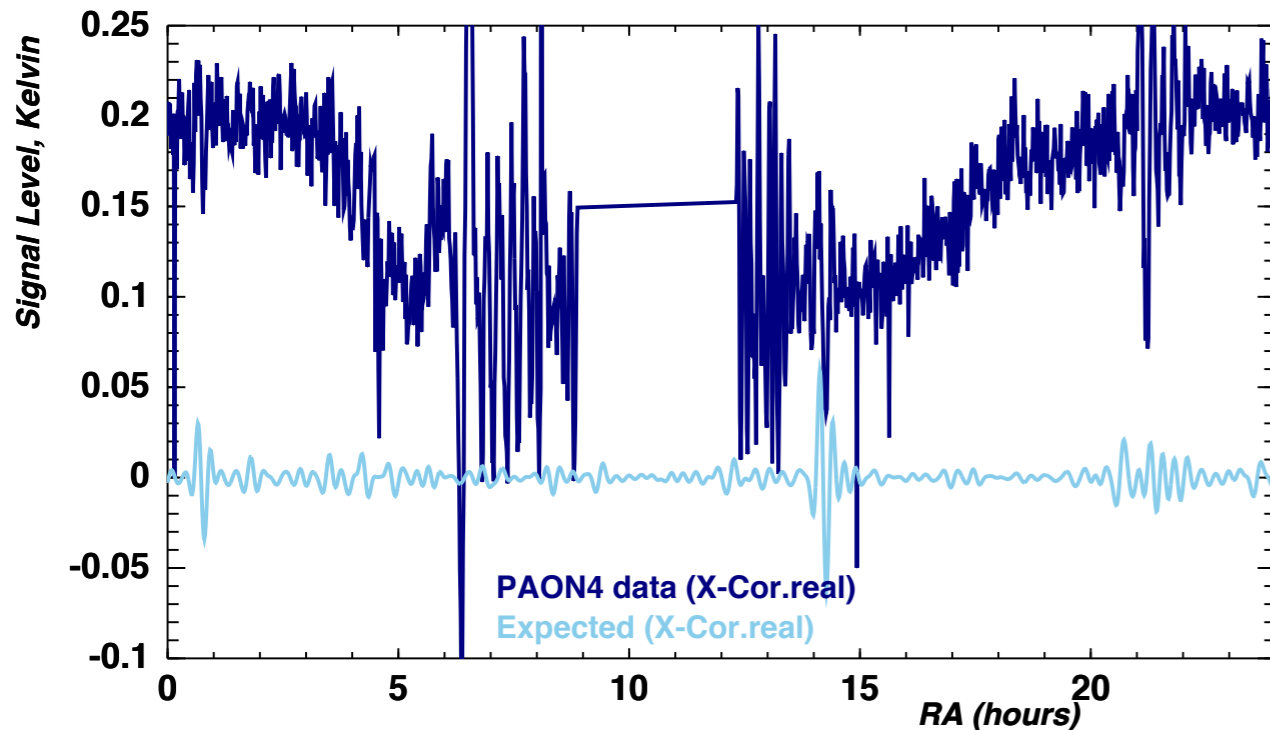


Scans A05 Elev=5.4 du 22/07 @ 1395 MHz

Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

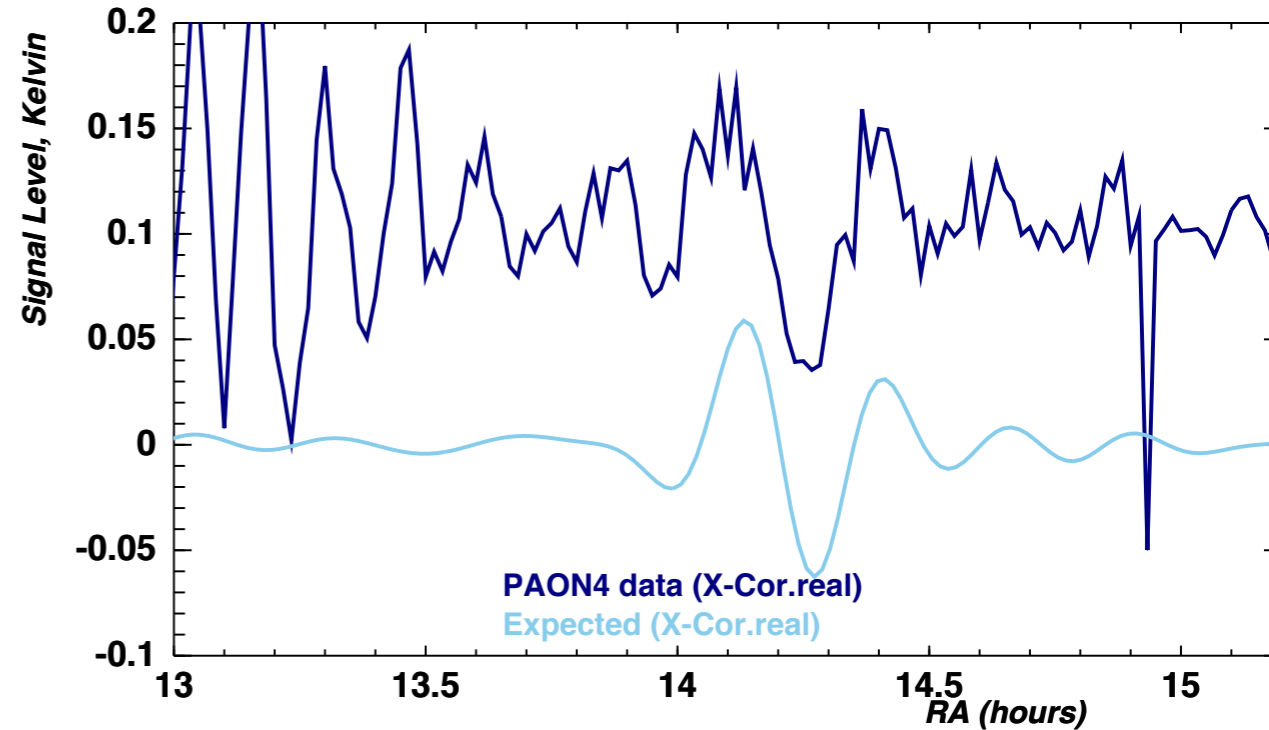
IH3H

PAON4 A05 (elev=5.4) and expected IH3H @ 1390 MHz

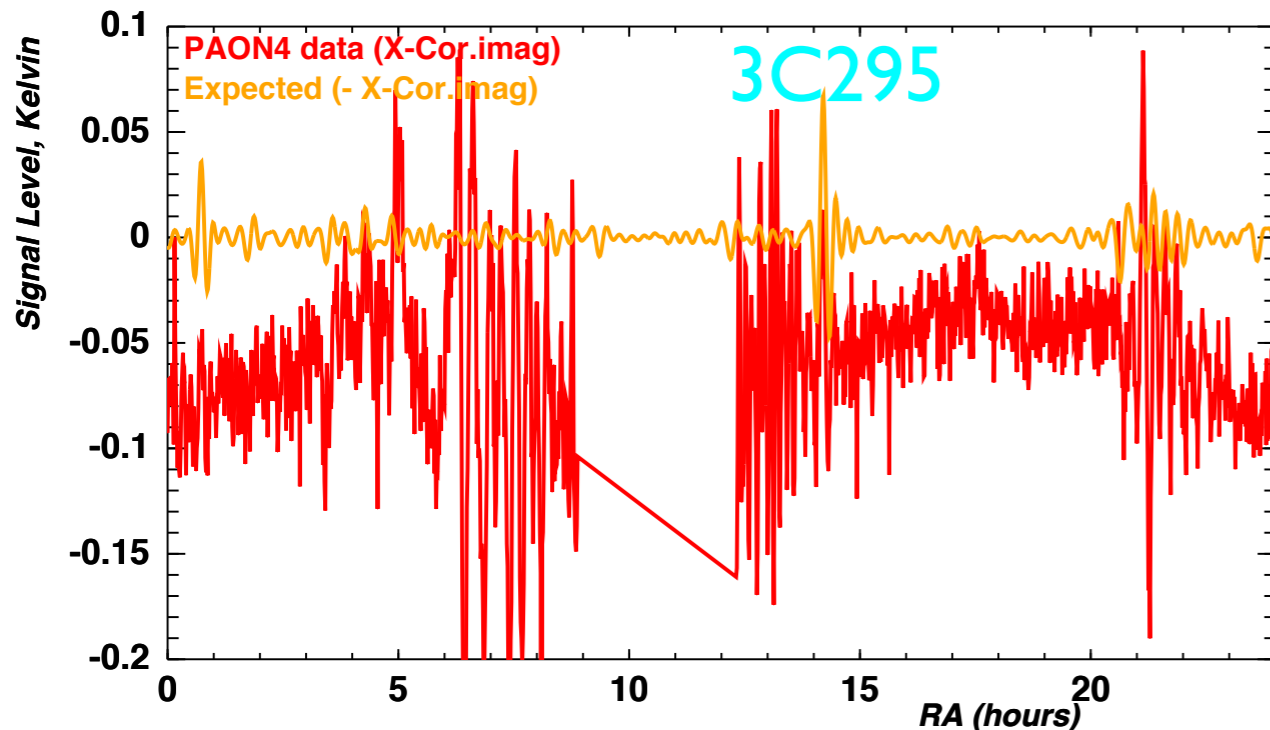


IH3H - zoom sur 3C295

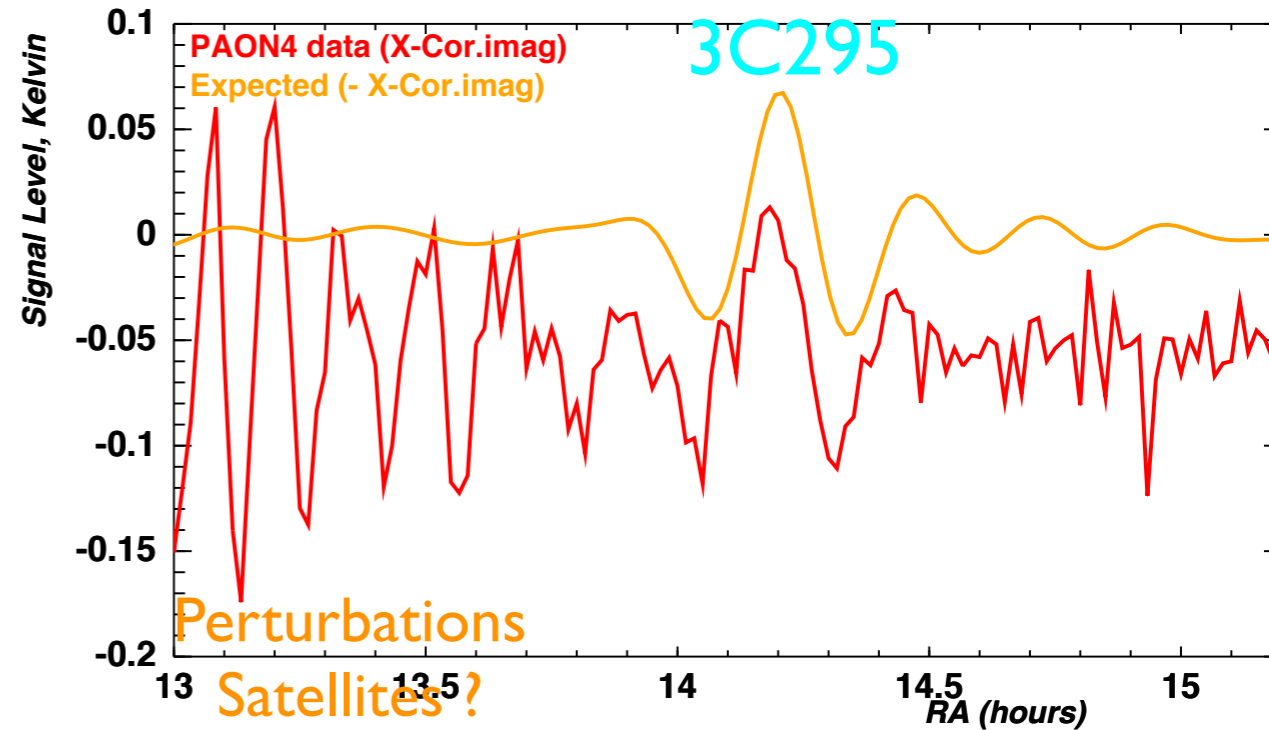
PAON4 A05 (elev=5.4) and expected IH3H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected IH3H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected IH3H @ 1390 MHz



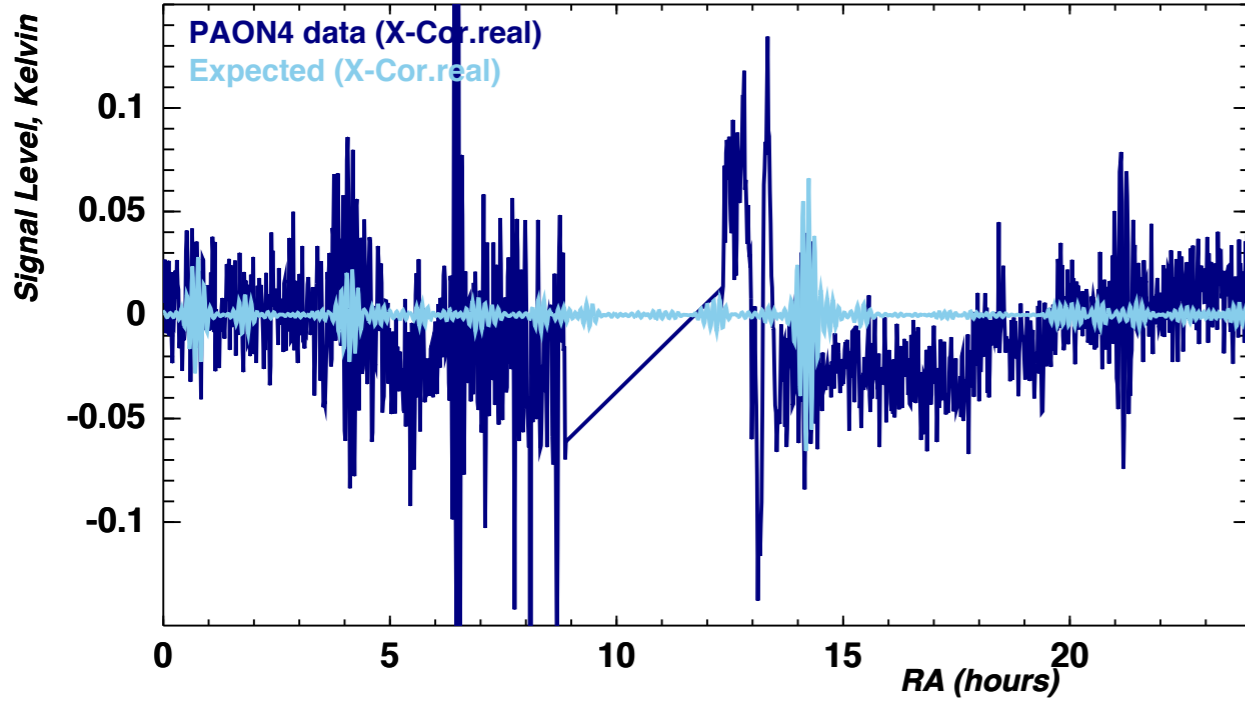
Scans A05 Elev=5.4 du 22/07 @ 1395 MHz

Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

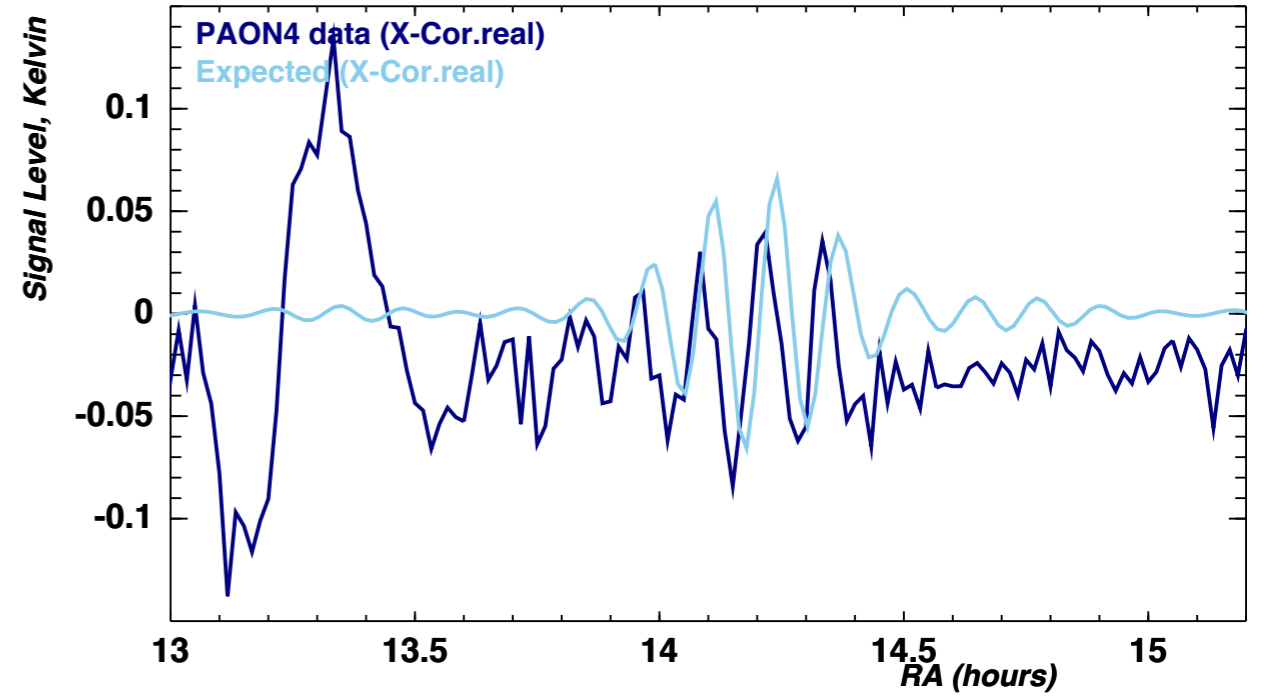
2H4H

2H4H - zoom sur 3C295

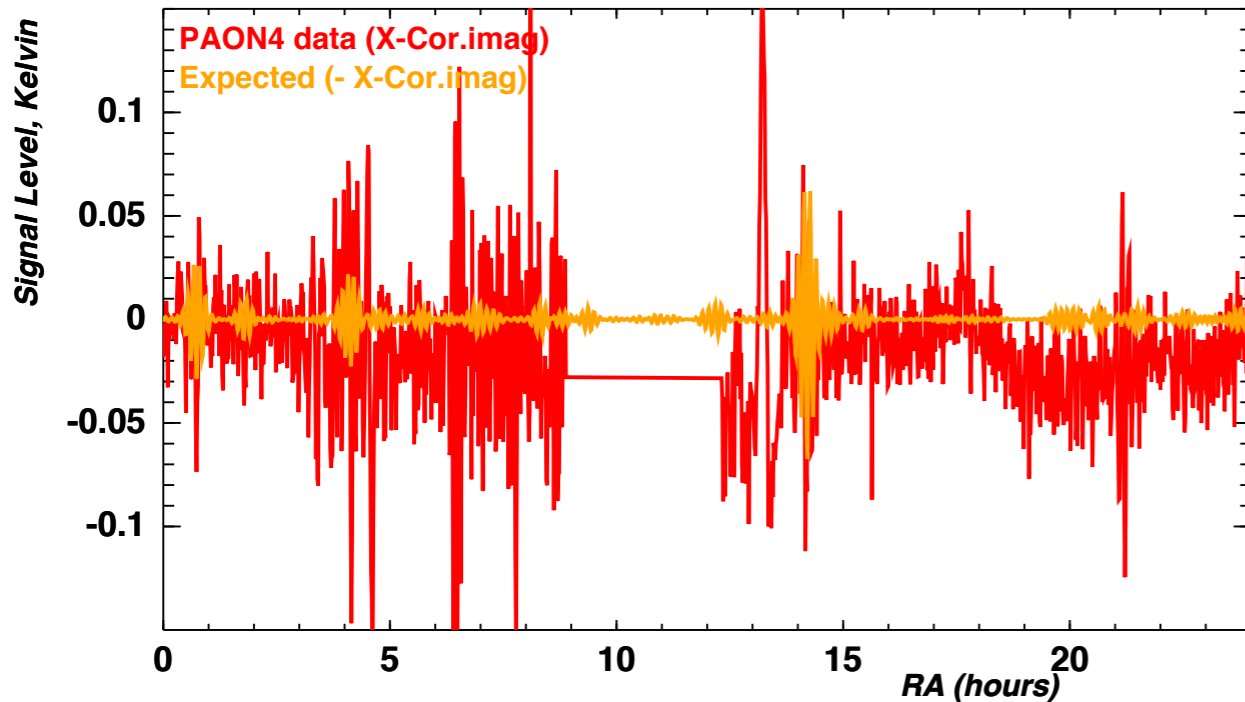
PAON4 A05 (elev=5.4) and expected 2H4H @ 1390 MHz



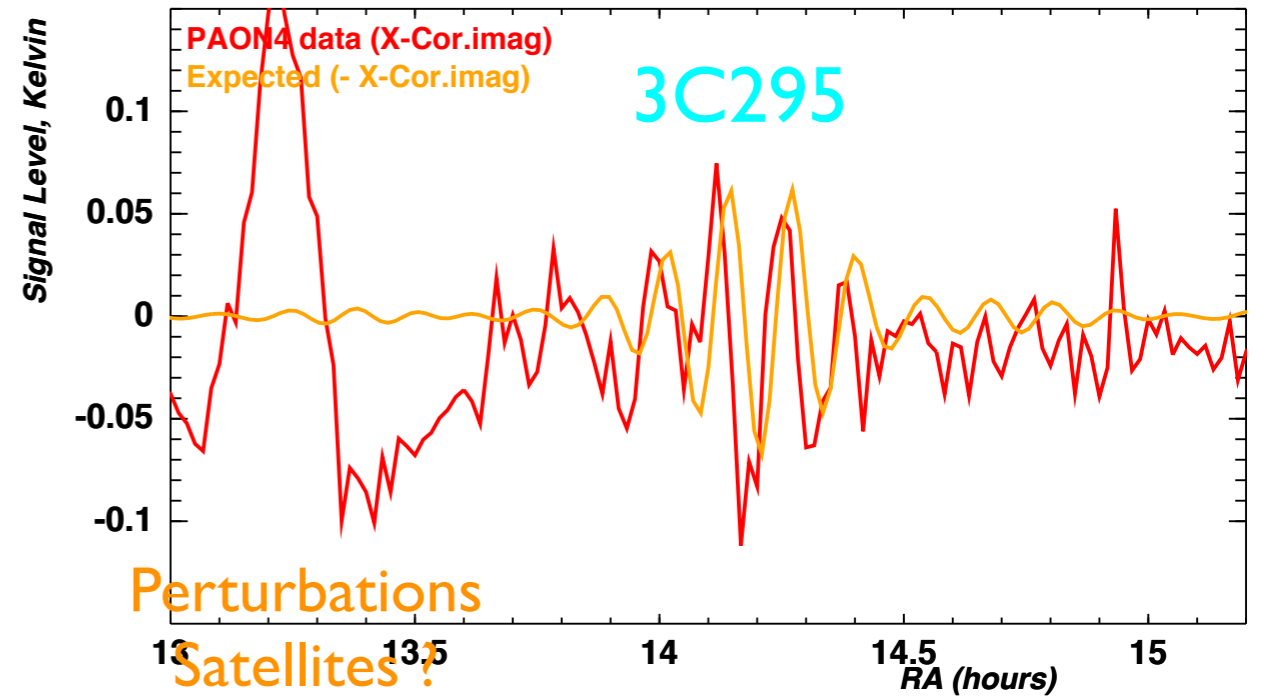
PAON4 A05 (elev=5.4) and expected 2H4H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected 2H4H @ 1390 MHz



PAON4 A05 (elev=5.4) and expected 2H4H @ 1390 MHz



Scans A06 Elev=4.4 du 23/07 @ 1420MHz

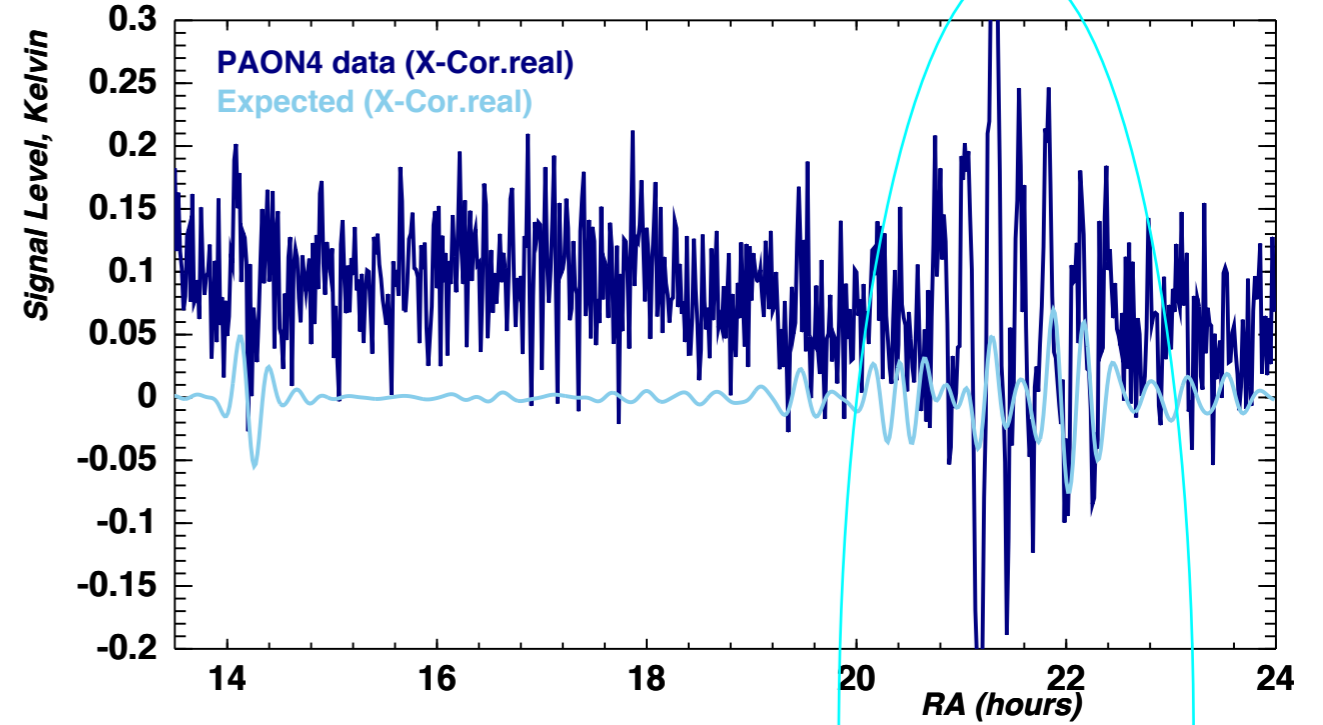
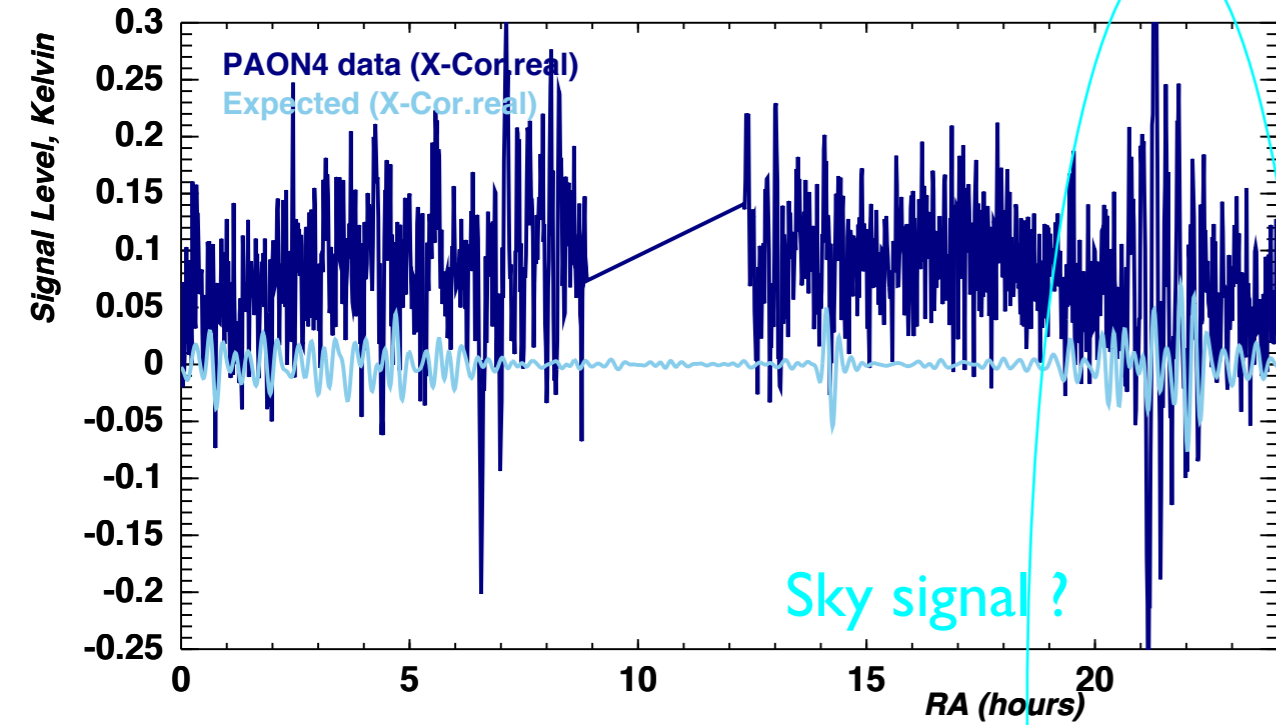
Proche de 3C295 ($\alpha=18^h11^m$, $\delta=52^d12'$)

IH3H

IH3H - zoom autour de 20h

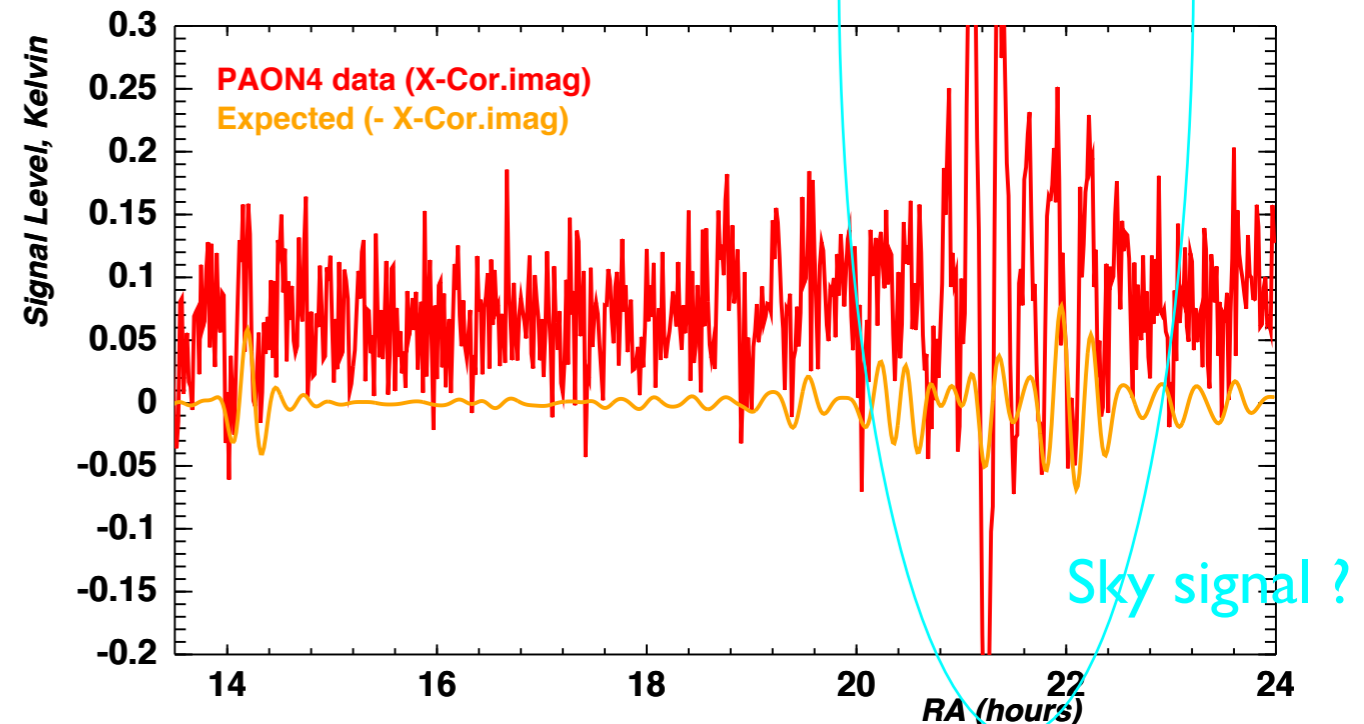
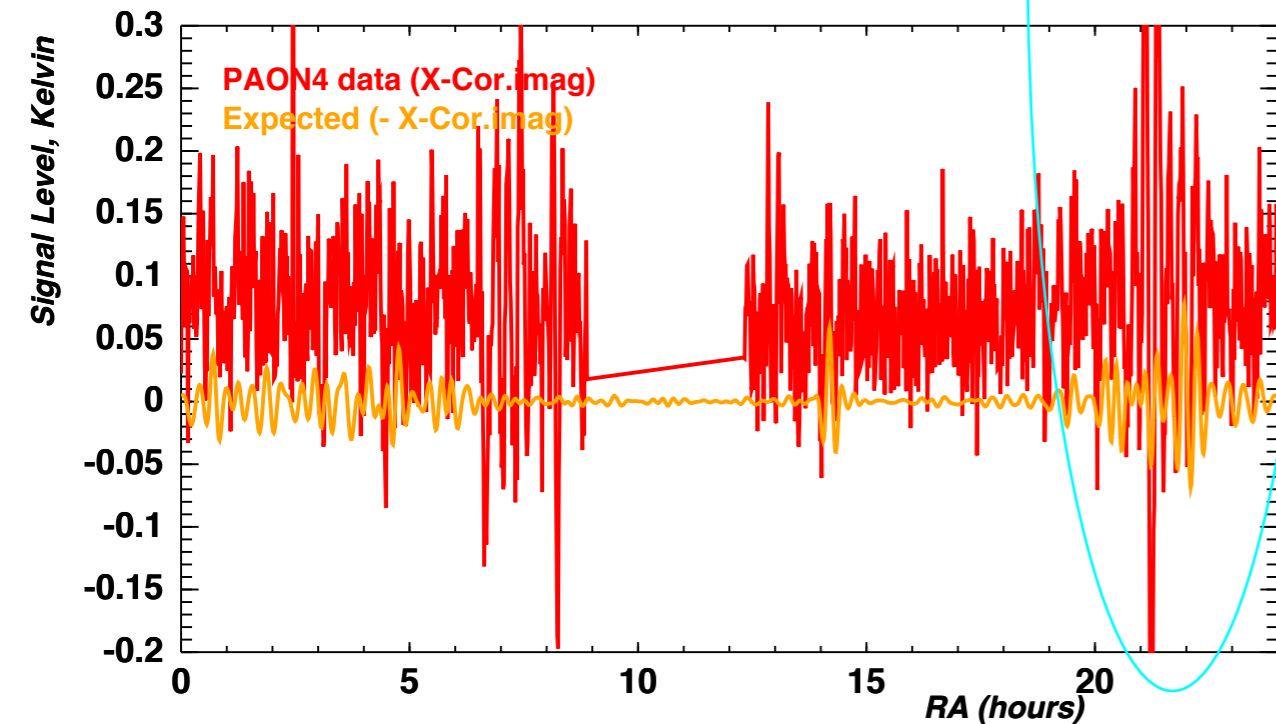
PAON4 A06 (elev=4.4) and expected IH3H @ 1420 MHz

PAON4 A06 (elev=4.4) and expected IH3H @ 1420 MHz



PAON4 A06 (elev=4.4) and expected IH3H @ 1420 MHz

PAON4 A06 (elev=4.4) and expected IH3H @ 1420 MHz

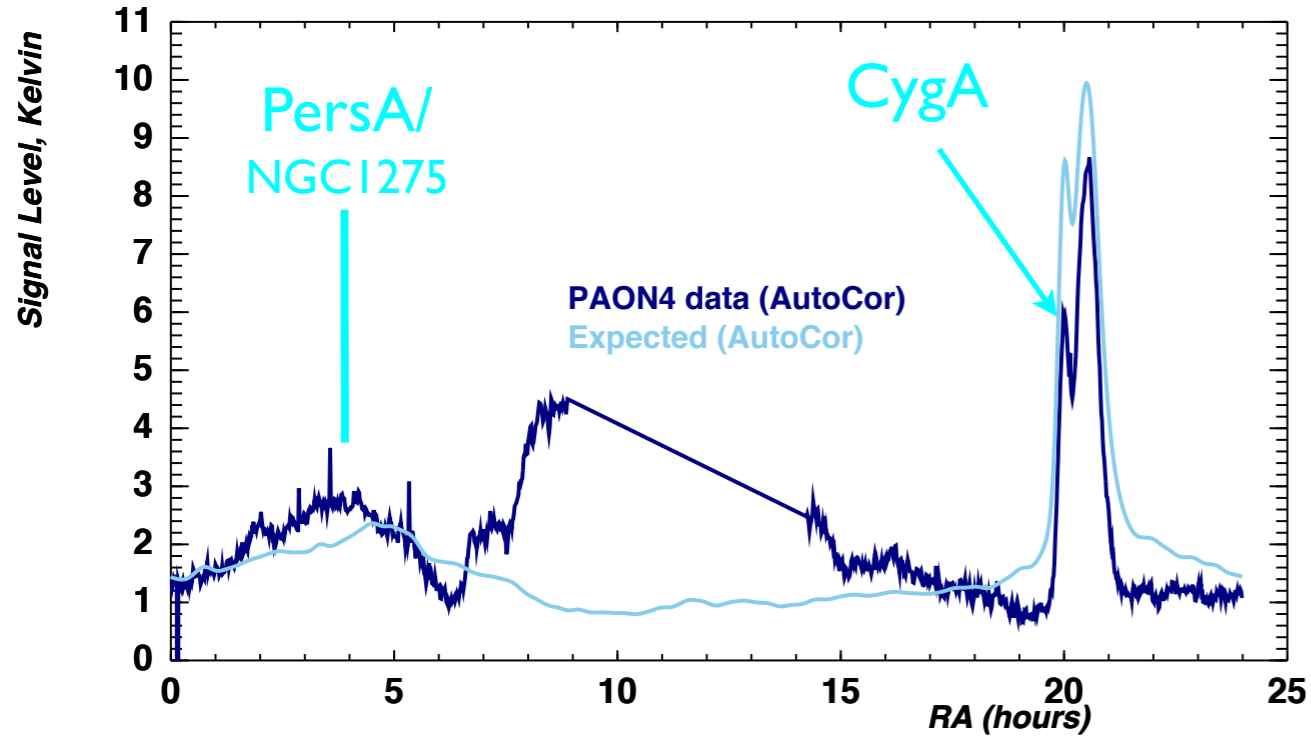


NGC 1275 (Pers A)
($\alpha=3\text{h}19'48''$, $\delta=41\text{d}30'42''$)

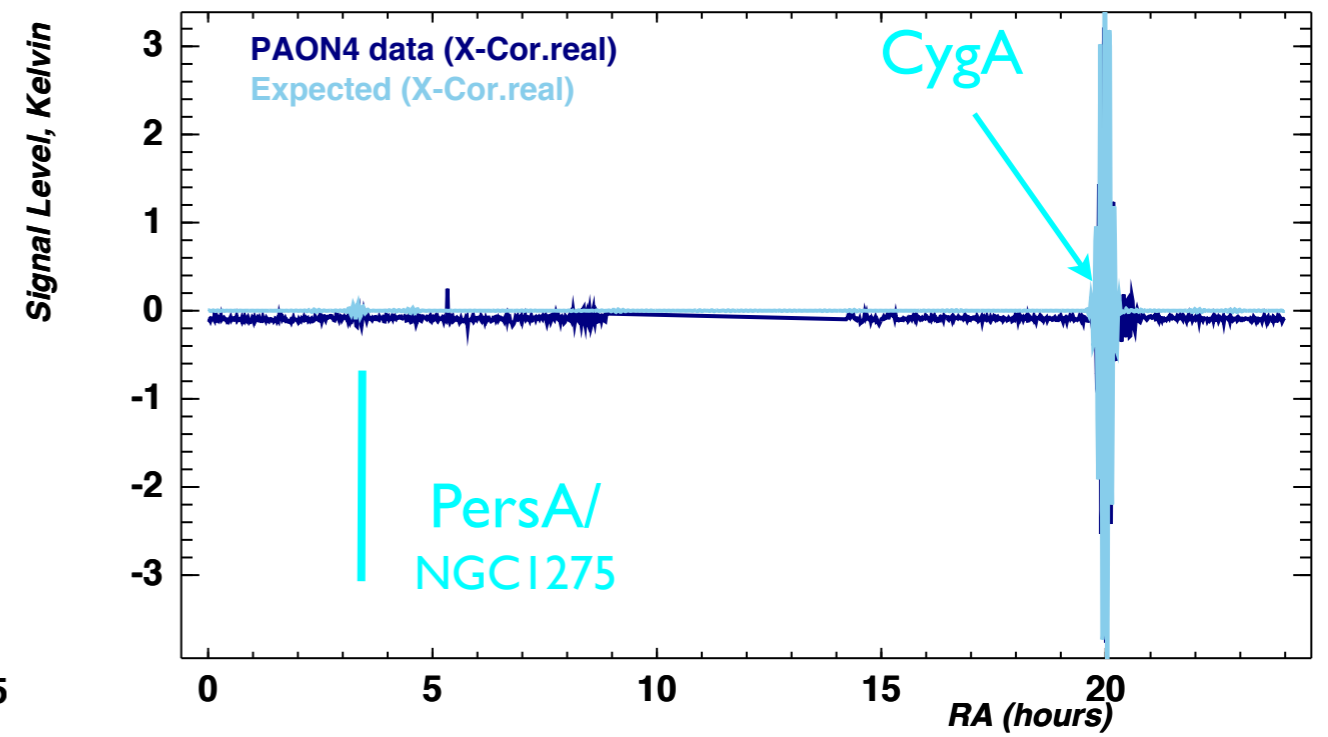
A19 Elev=-5.4

Scans A19 Elev=-5.6 du 14/08 @ 1395 MHz NGC1275 ($\alpha=3h19'48''$, $\delta=41d30'42''$) et proche de CygA

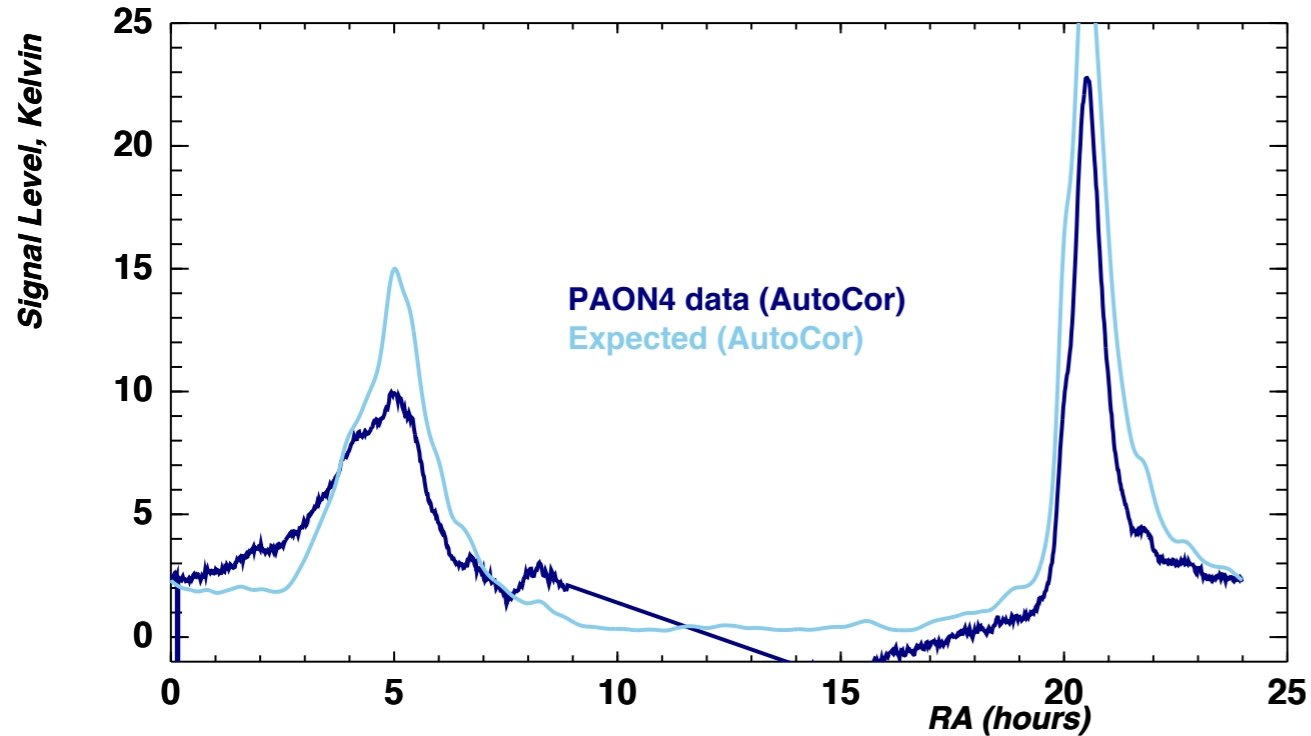
PAON4 A19 (elev=-5.6) and expected AutoCor @ 1390 MHz



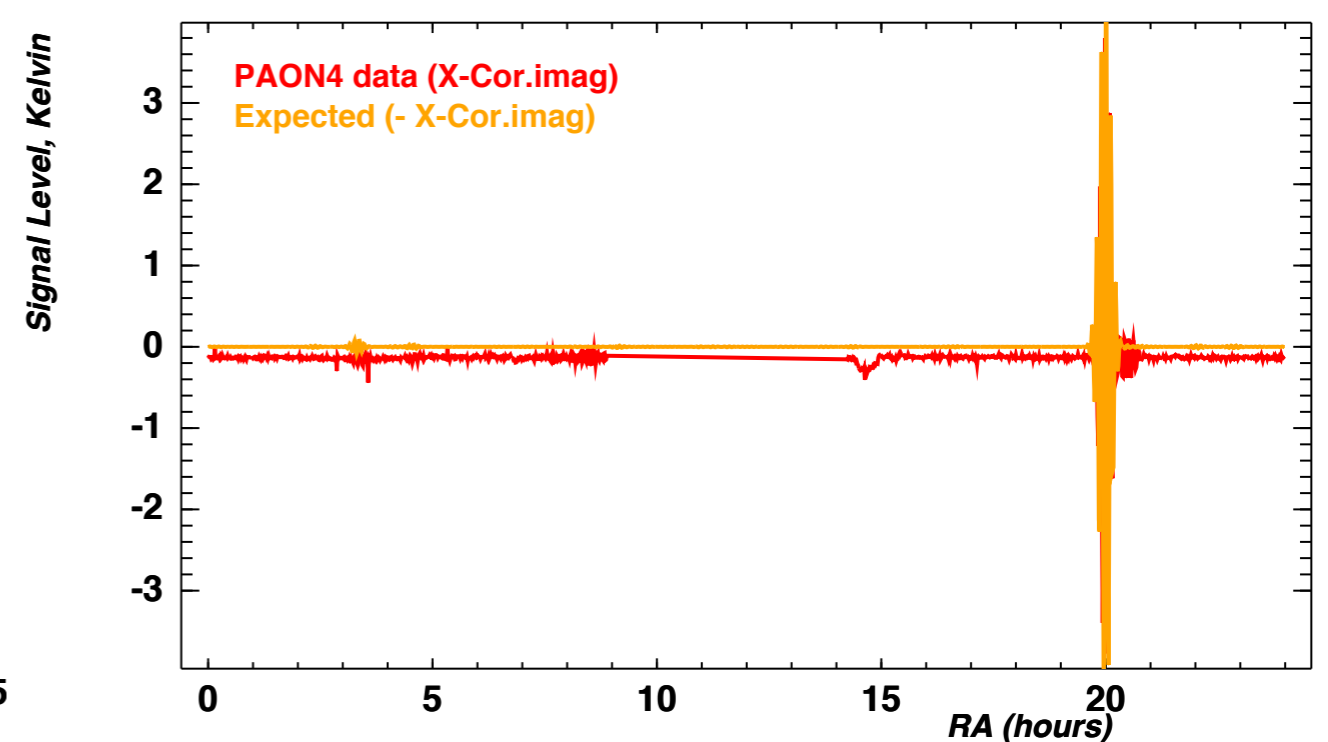
PAON4 A19 (elev=-5.6) and expected 2H4H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected AutoCor @ 1420 MHz



PAON4 A19 (elev=-5.6) and expected 2H4H @ 1390 MHz



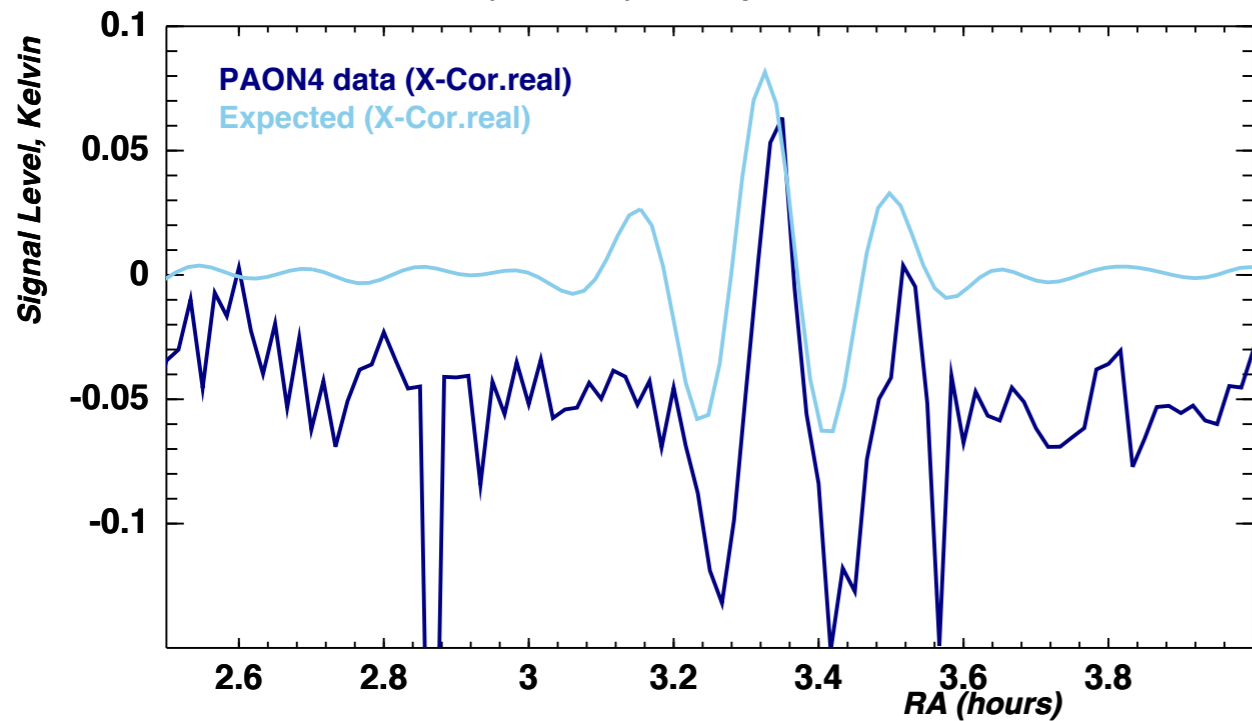
Scans A19 Elev=-5.6 du 14/08 @1395 MHz

Zoom autour de NGC1275 ($\alpha=3h19'48''$, $\delta=41d30'42''$)

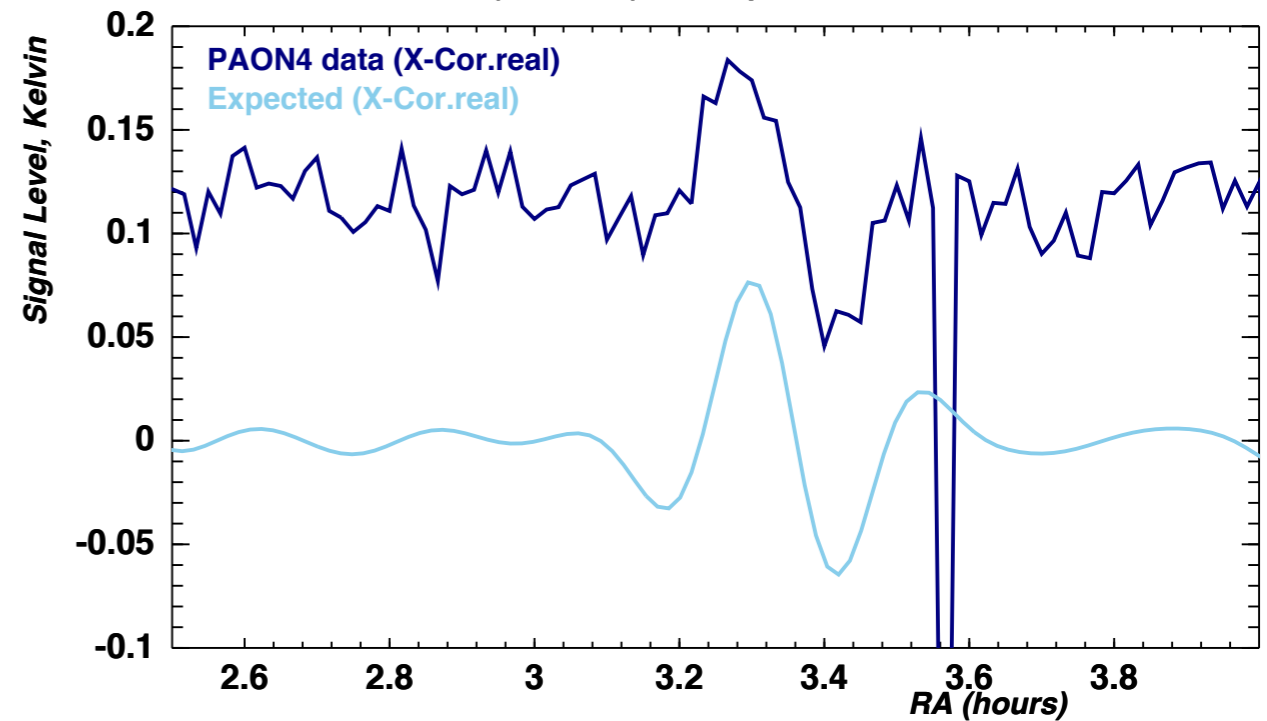
1H2H

1H3H

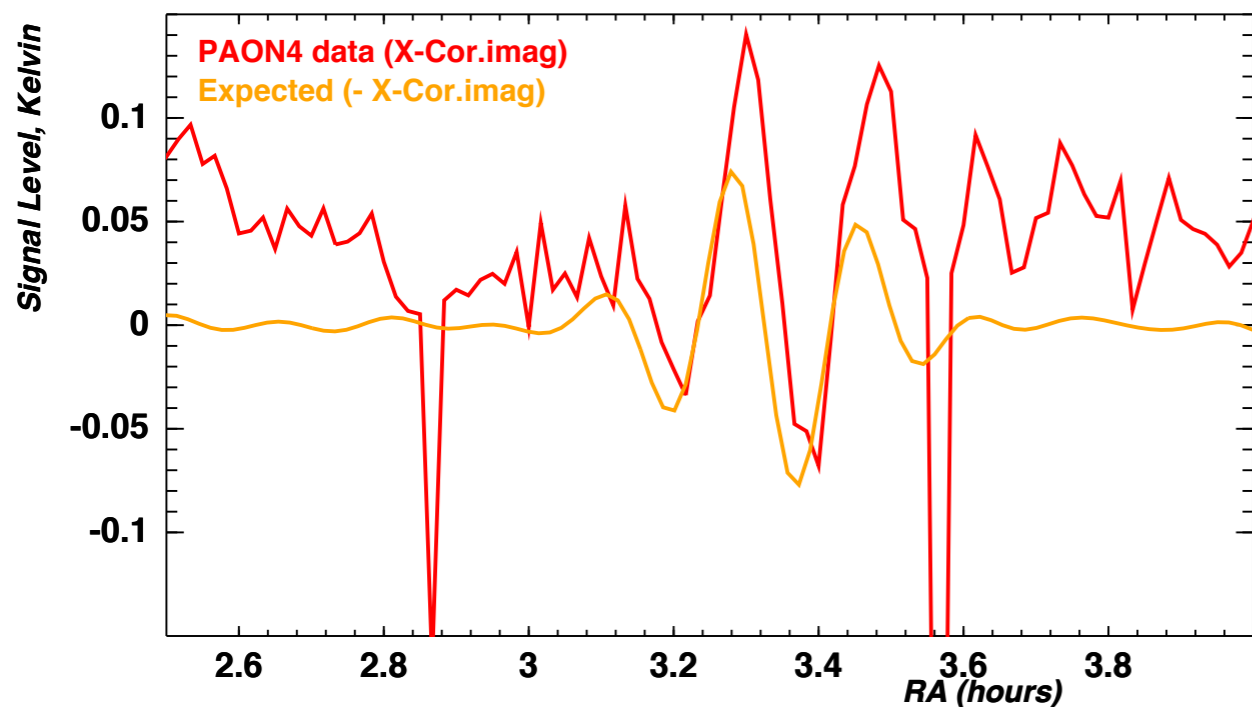
PAON4 A19 (elev=-5.6) and expected 1H2H @ 1390 MHz



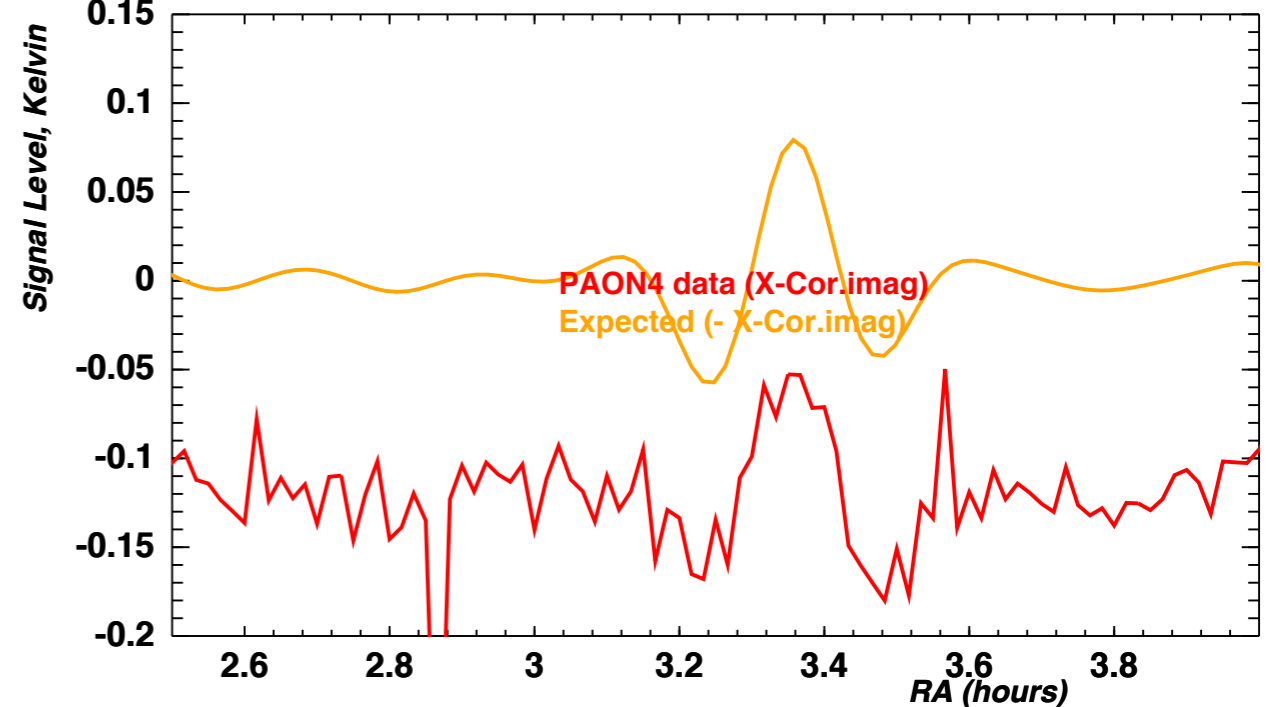
PAON4 A19 (elev=-5.6) and expected 1H3H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 1H2H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 1H3H @ 1390 MHz



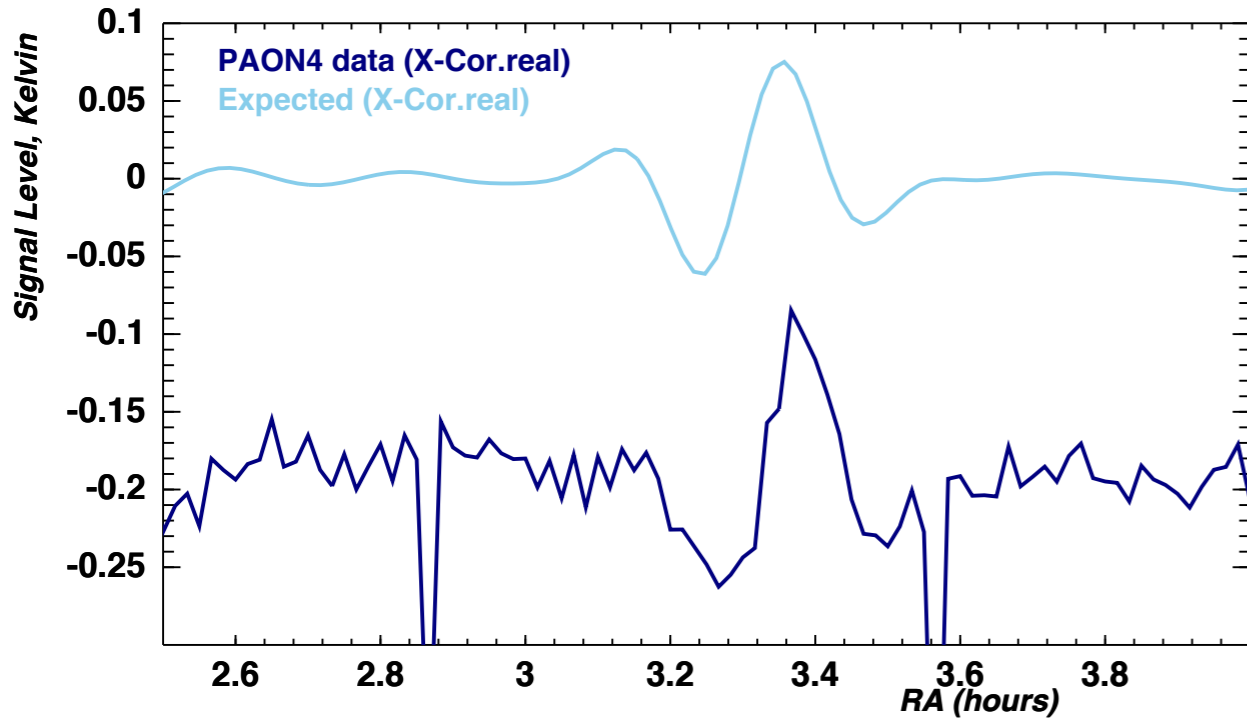
Scans A19 Elev=-5.6 du 14/08 @1395 MHz

Zoom autour de NGC1275 ($\alpha=3^h19^m48^s$, $\delta=41^d30^m42^s$)

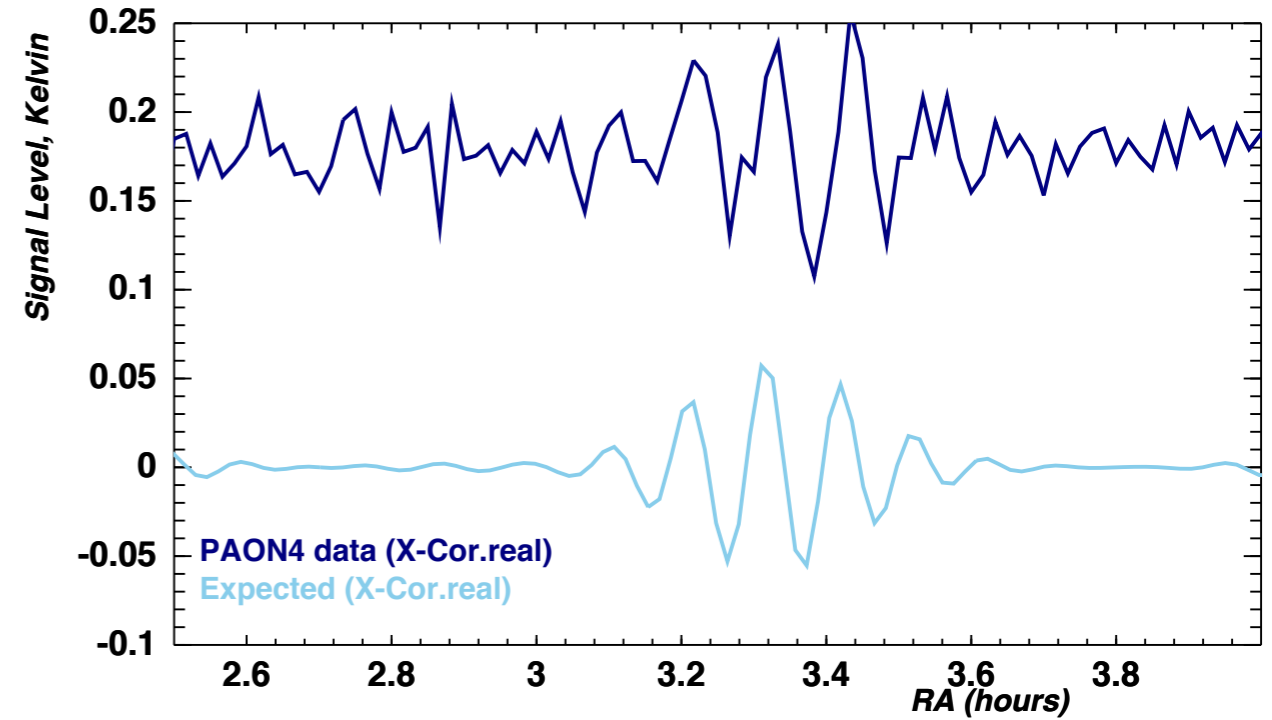
1H4H

2H3H

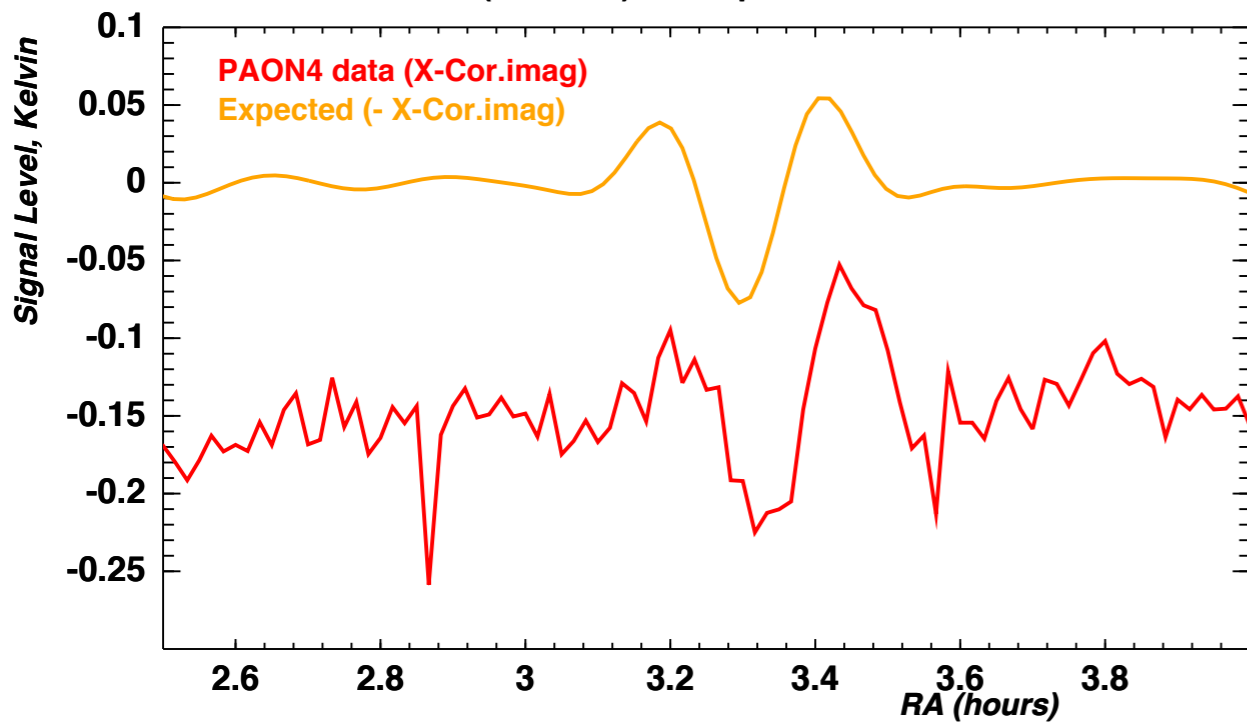
PAON4 A19 (elev=-5.6) and expected 1H4H @ 1390 MHz



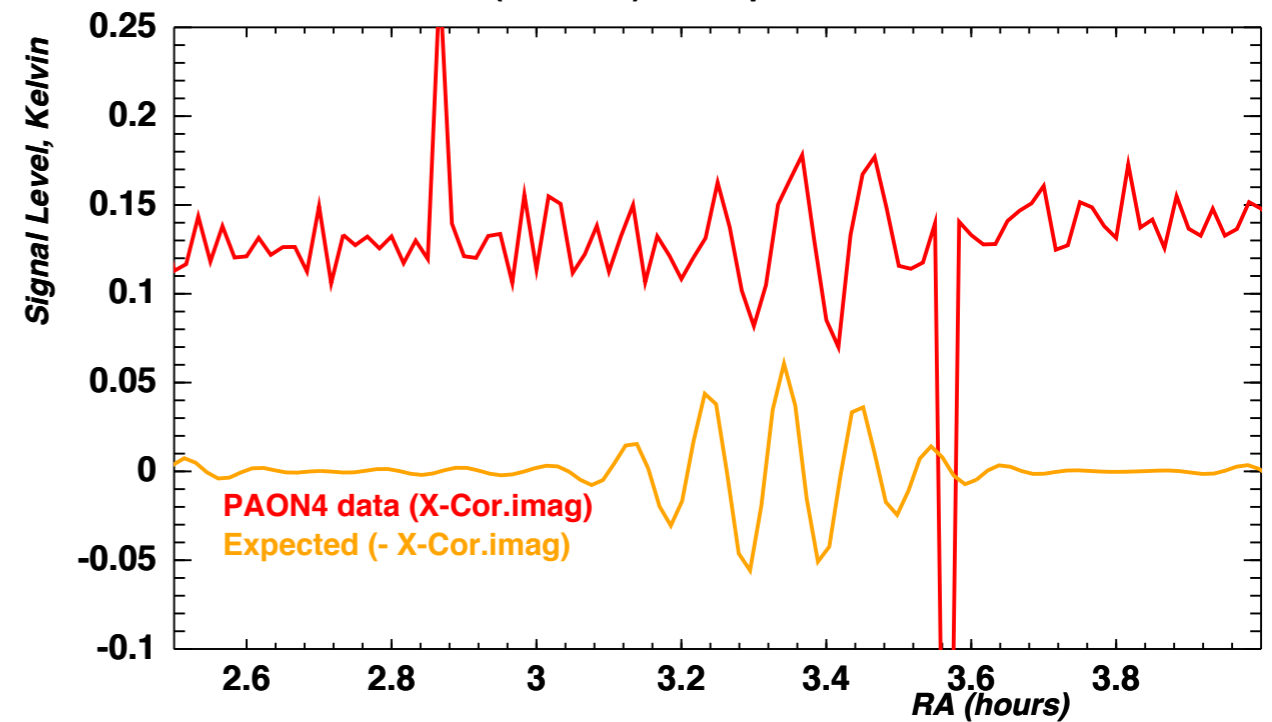
PAON4 A19 (elev=-5.6) and expected 2H3H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 1H4H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 2H3H @ 1390 MHz



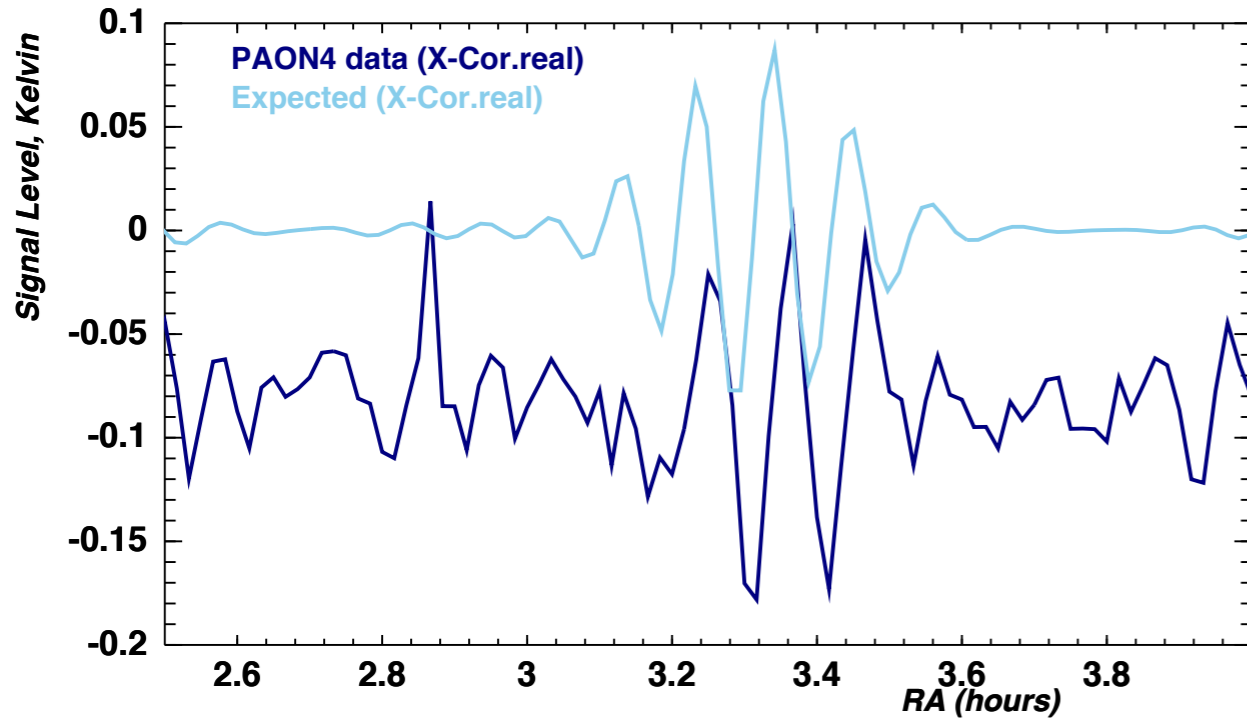
Scans A19 Elev=-5.6 du 14/08 @1395 MHz

Zoom autour de NGC1275 ($\alpha=3h19'48''$, $\delta=41d30'42''$)

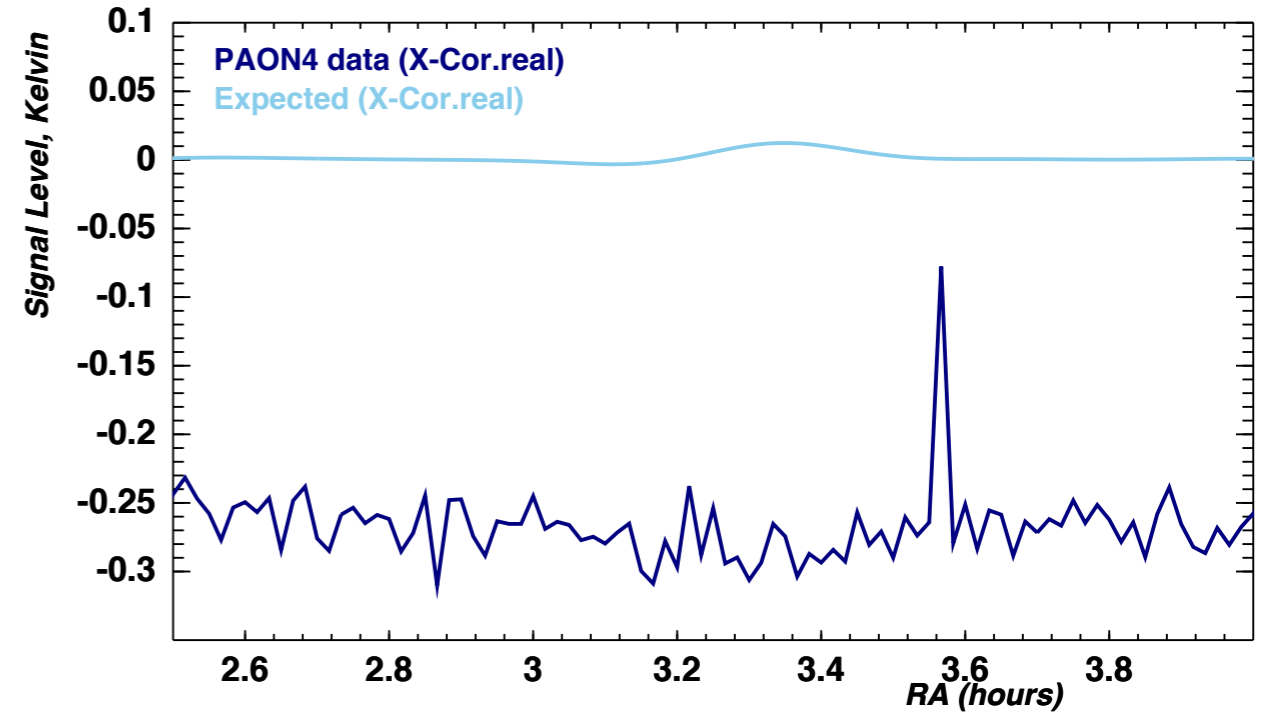
2H4H

3H4H

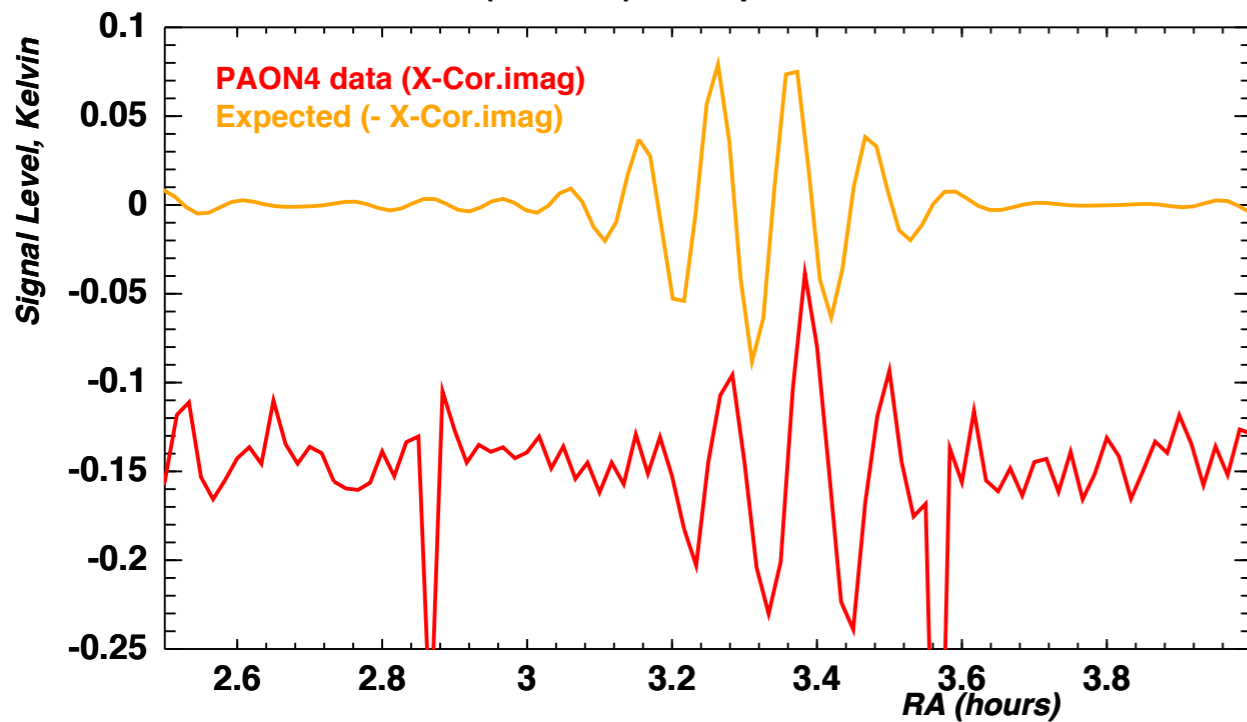
PAON4 A19 (elev=-5.6) and expected 2H4H @ 1390 MHz



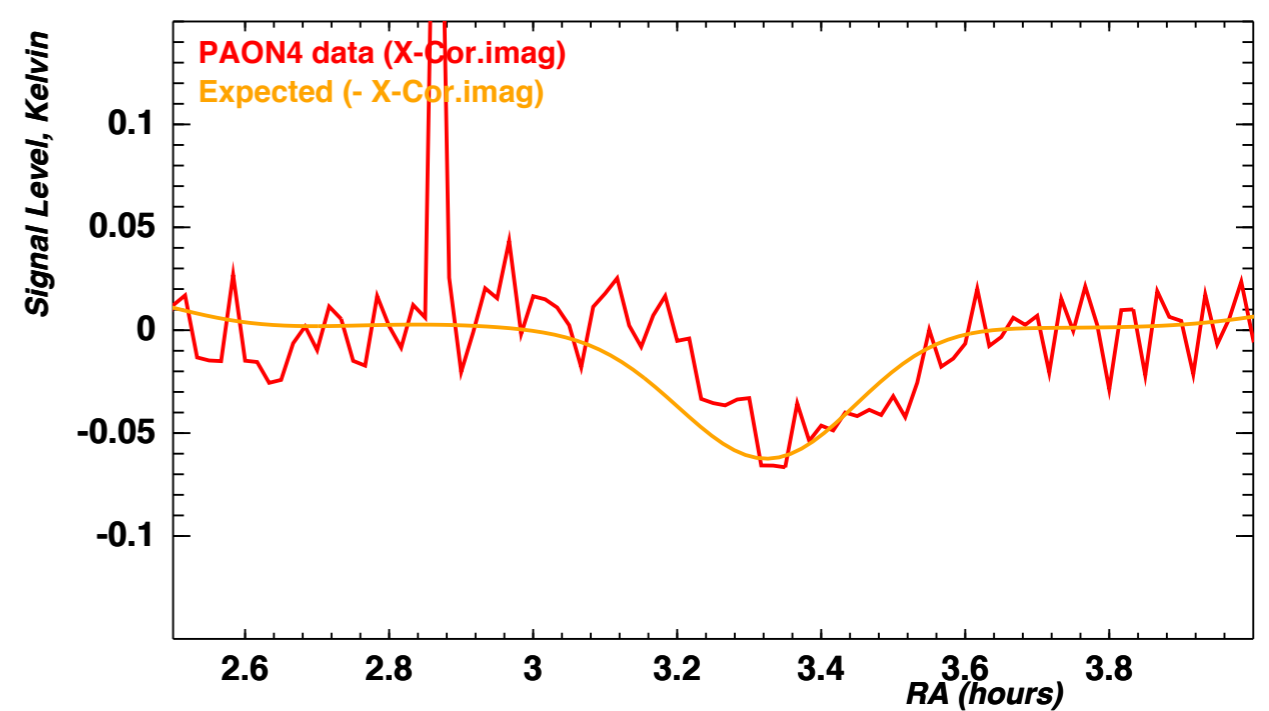
PAON4 A19 (elev=-5.6) and expected 3H4H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 2H4H @ 1390 MHz



PAON4 A19 (elev=-5.6) and expected 3H4H @ 1390 MHz



Scans du 14/08 A19 Elev=-5.6 @1420 MHz

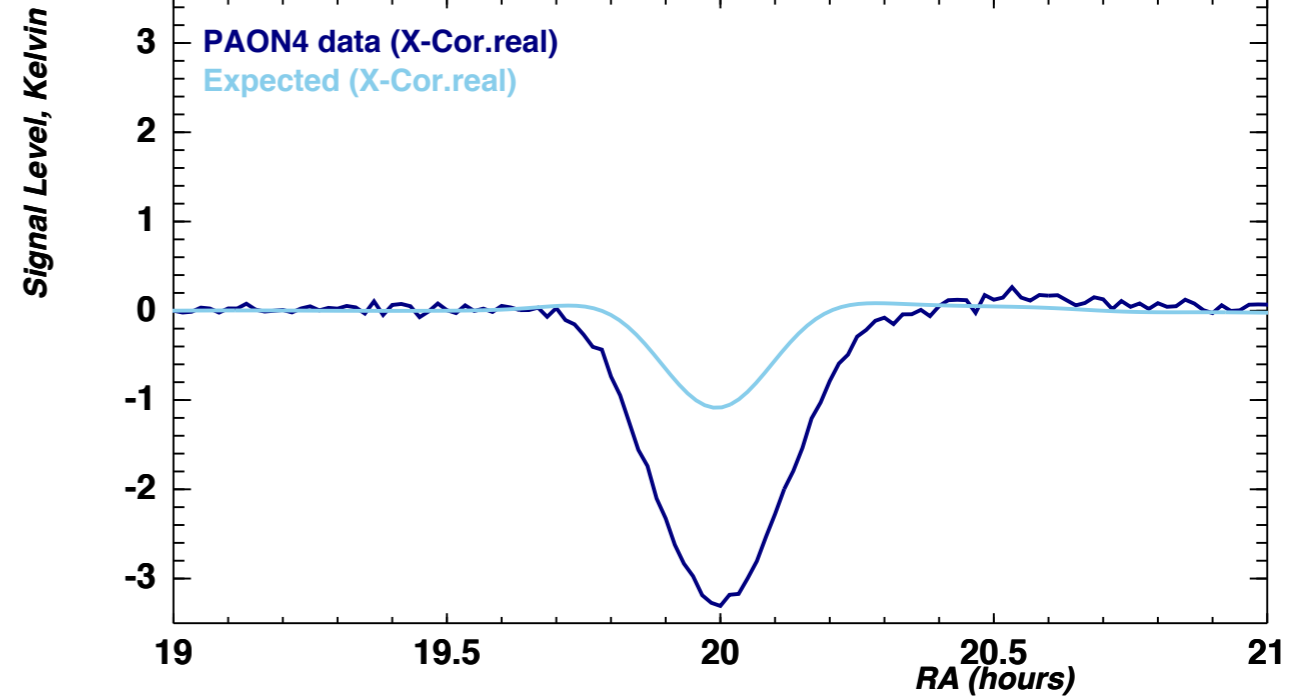
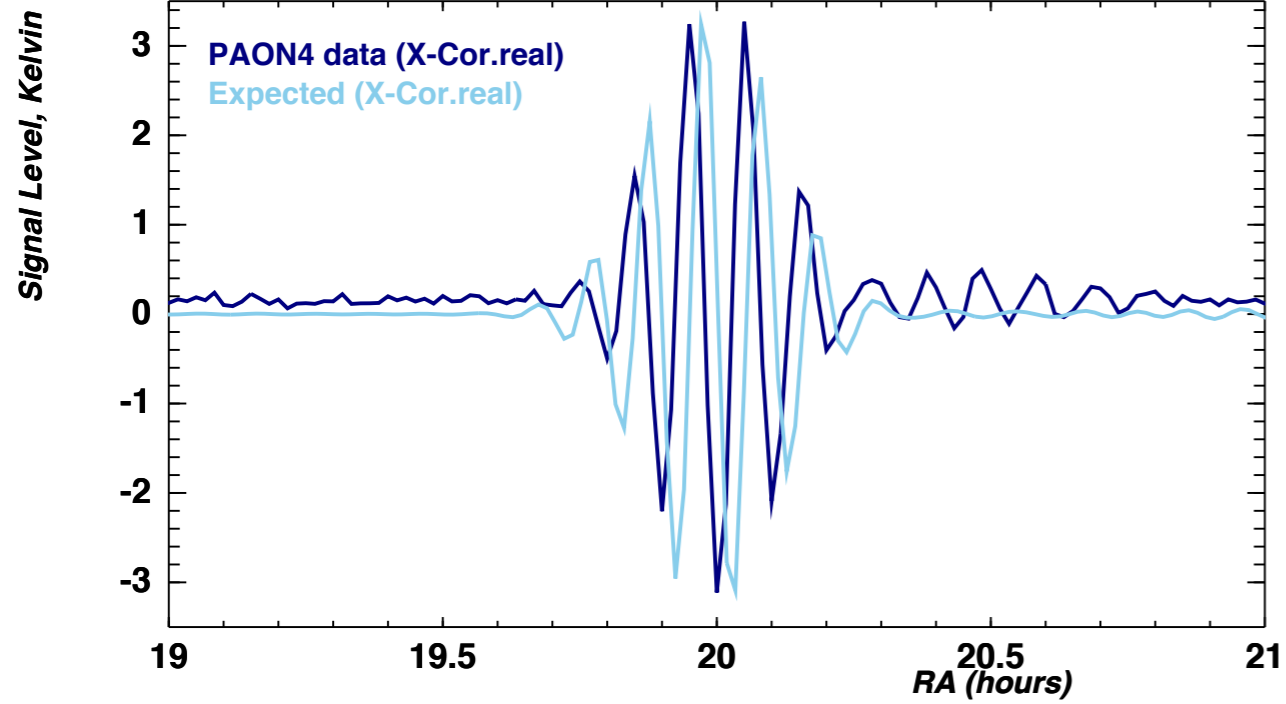
Zoom autour de CygA ($\alpha=19^{\text{h}}59'$, $\delta=40^{\text{d}}44'$)

2H4H

3H4H

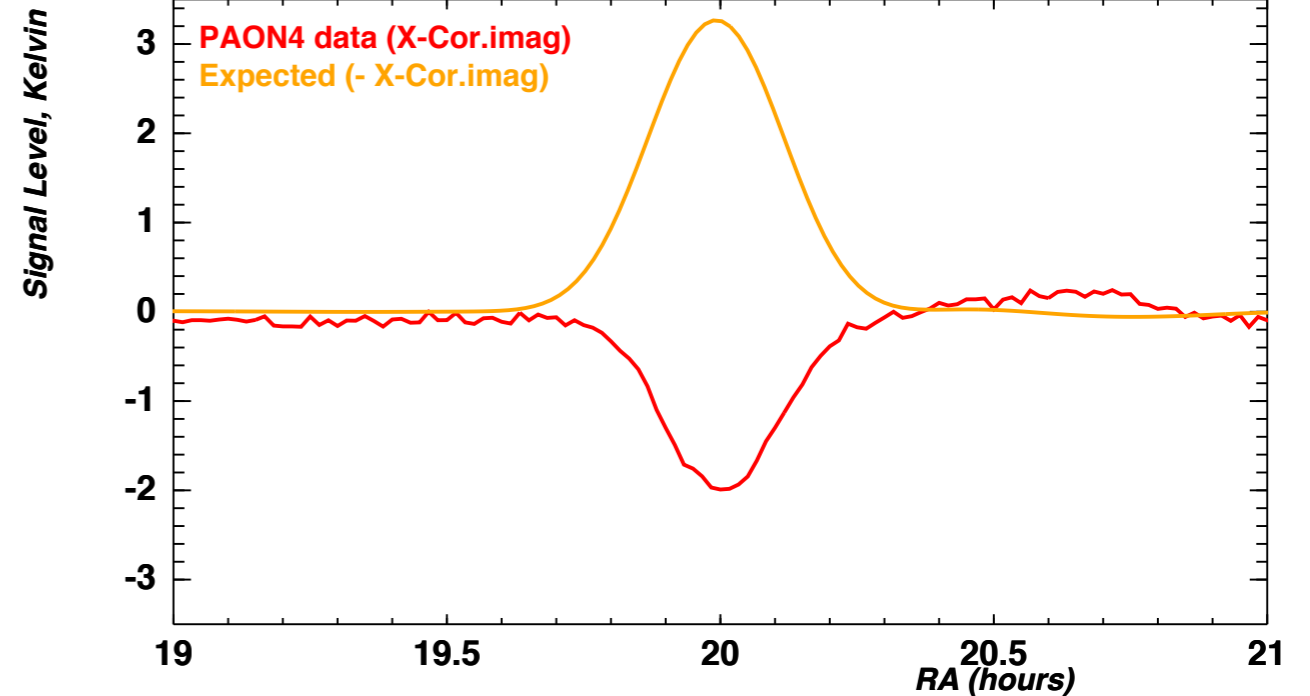
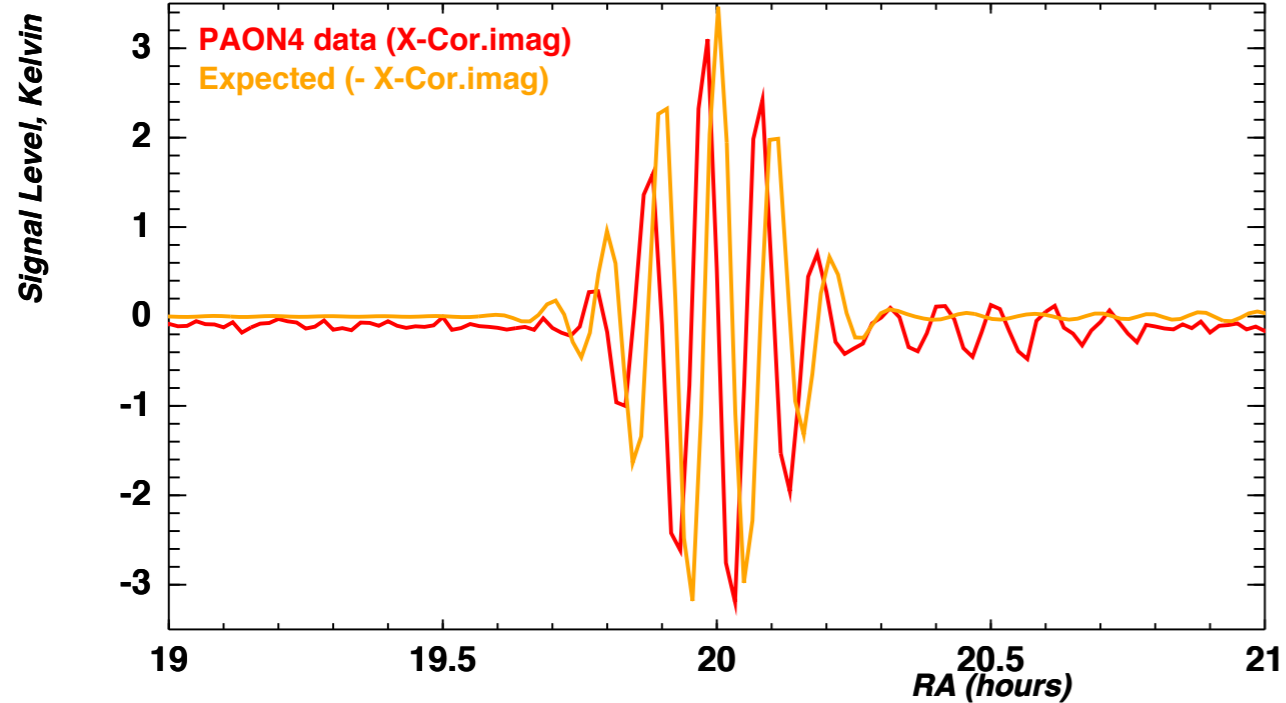
PAON4 A19 (elev=-5.6) and expected 2H4H @ 1420 MHz

PAON4 A19 (elev=-5.6) and expected 3H4H @ 1420 MHz



PAON4 A19 (elev=-5.6) and expected 2H4H @ 1420 MHz

PAON4 A19 (elev=-5.6) and expected 3H4H @ 1420 MHz



Conclusions préliminaires

- Résultats presque conformes aux attentes
- Franges sources brillantes OK ,
- $T_{\text{Sys}} \sim 100\text{-}105\text{ K}$, mais il reste du bruit corrélé et des RFI, diminuant de fait la sensibilité de l'instrument
- Effet du soleil, ($\sim 2\text{K}\text{-}3\text{K}$) autour de midi solaire
- D'autres RFI, probablement les satellites polluent également le signal
- On constate aussi un niveau moyen des visibilités (re, im) qui n'est pas à zéro. S'agit-il d'un effet du bruit corrélé ?
- Il faudra mettre en place un filtrage/masquage temps-fréquence
- Signaux des sources $\sim 20\text{ Jy}$ assez bien visible, mais il faudra améliorer la sensibilité de PAON4
- Il serait probablement utile de refaire des scans, au moins autour d'une de sources $\sim 20\text{ Jy}$...