

## Alignment of the EMIR pixels. Ver. 1

10-November-2011

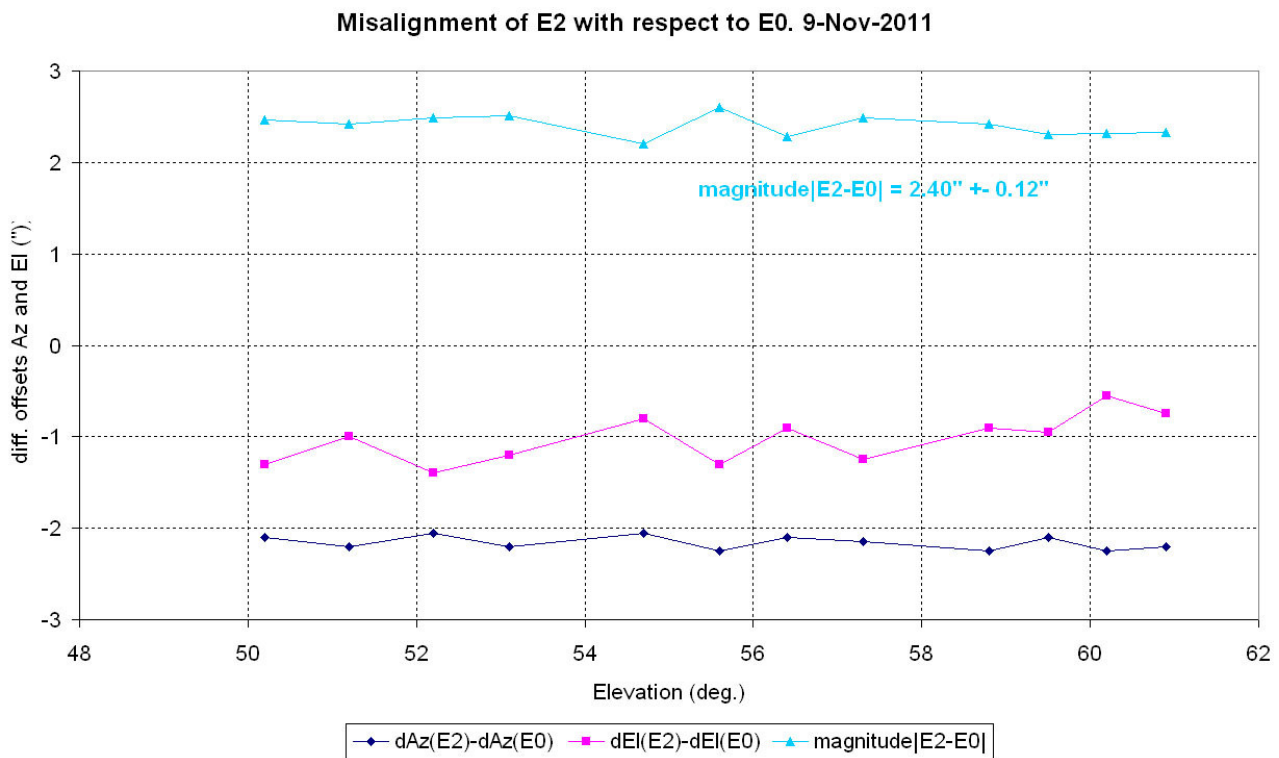
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On weeks 44 and 45 of 2011 the EMIR receiver has been upgraded with new a chain of components on pixels E2 and E3 that enlarge the corresponding band pass. Technical time has been used after that work in order to check the alignment of the pixels. The frequencies used have been E0 at 86 GHz, E1 at 145 GHz, E2 at 230 GHz and E3 at 280 GHz

The alignment has been checked by means of pointing scans on planet Mars, 6.2'' diameter, in the elevation range 50° to 67°. The pixel E0 is considered the reference pixel for the antenna pointing model, then when possible the other pixels are referred to E0. Focus scans have been also done to check the axial focus alignment. Results are below.

### Alignment E2, E0

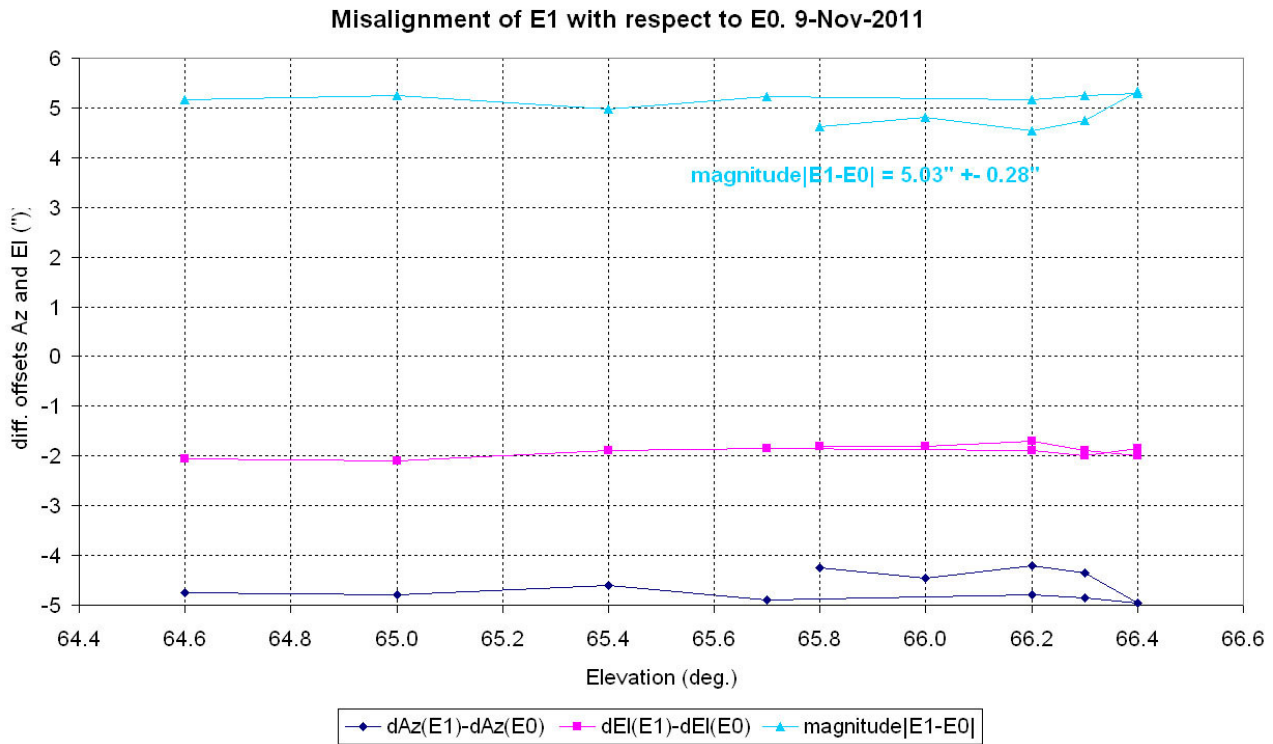
The alignment between E2 and E0 has been measured with 12 pointing scans in the elevation range 50° to 61°. The pointing corrections of the horizontal and vertical polarizations have been averaged, and then the alignment has been checked. The magnitude of the alignment between E2 and E0 has resulted to be **2.40''± 0.12''**. The graphic below shows the result of the pointing scans.



Four focus scans have been done to determine the axial focus correction of E2 with respect to E0 being the result **0.12 ± 0.01 mm**.

## Alignment E1, E0

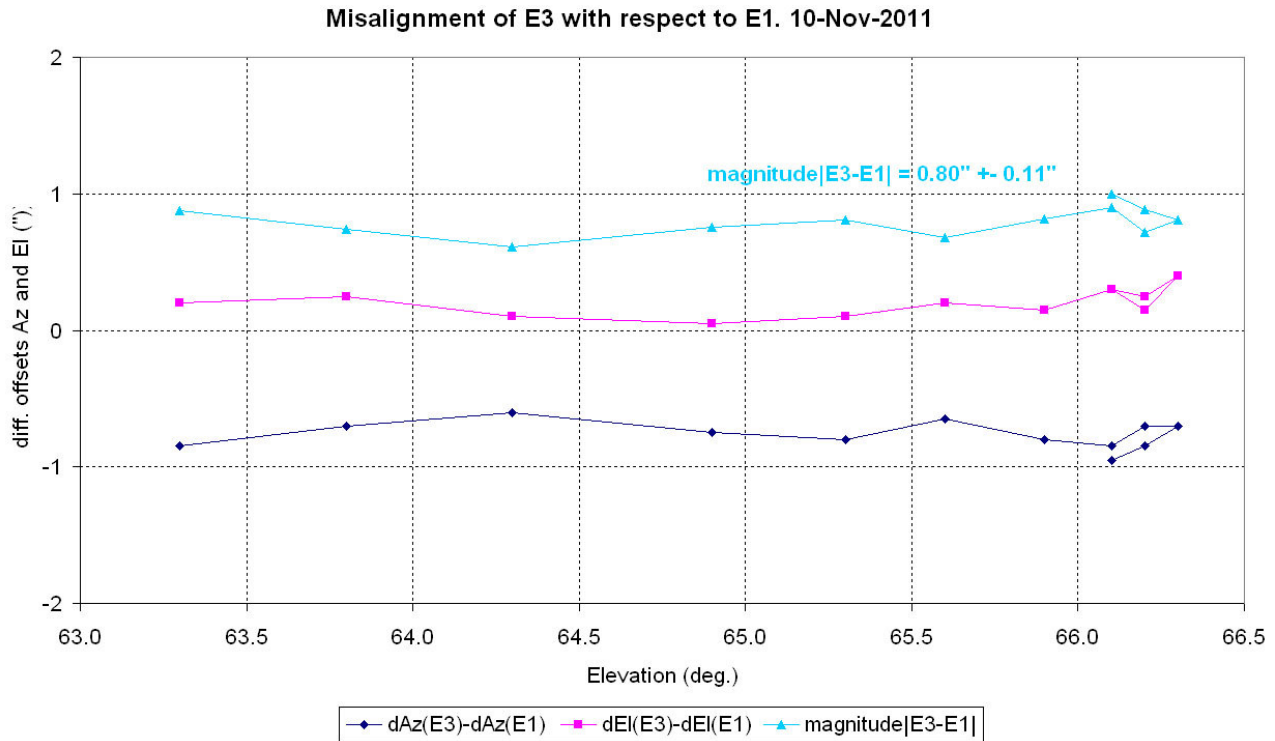
The alignment between E1 and E0 has been measured with 12 pointing scans in the elevation range  $64^\circ$  to  $67^\circ$ . The pointing corrections of the horizontal and vertical polarizations have been averaged, and then the alignment has been checked. The magnitude of the alignment between E1 and E0 has resulted to be  $5.03'' \pm 0.28''$ . This result is significantly higher than the previous value measured on 16-Sep-2009 that was  $1.98''$ . The graphic below shows the result of the pointing scans.



Four focus scans have been done to determine the axial focus correction of E2 with respect to E0 being the result  $0.19 \pm 0.08$  mm.

## Alignment E3, E1

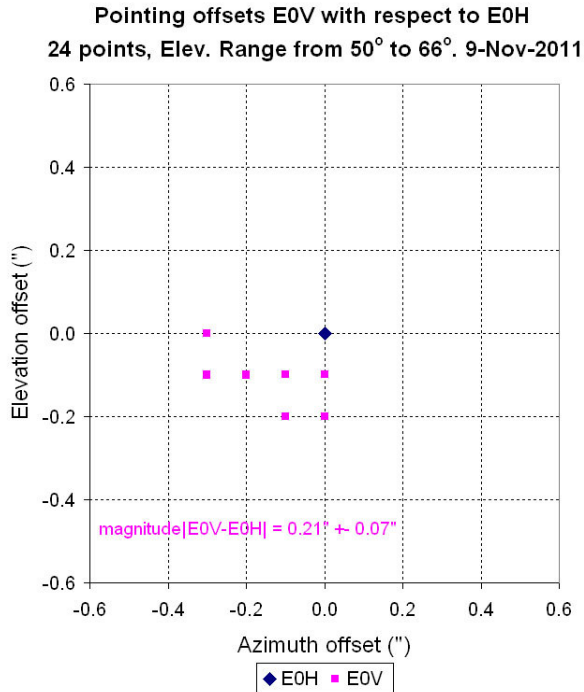
The alignment between E3 and E1 has been measured with 12 pointing scans in the elevation range  $63^\circ$  to  $67^\circ$ . The pointing corrections of the horizontal and vertical polarizations have been averaged, and then the alignment has been checked. The magnitude of the alignment between E3 and E1 has resulted to be  $0.80'' \pm 0.11''$ . The graphic below shows the result of the pointing scans.



Five focus scans have been done to determine the axial focus correction of E3 with respect to E1 being the result  $-0.15 \pm 0.02$  mm.

### Alignment between both E0 polarizations

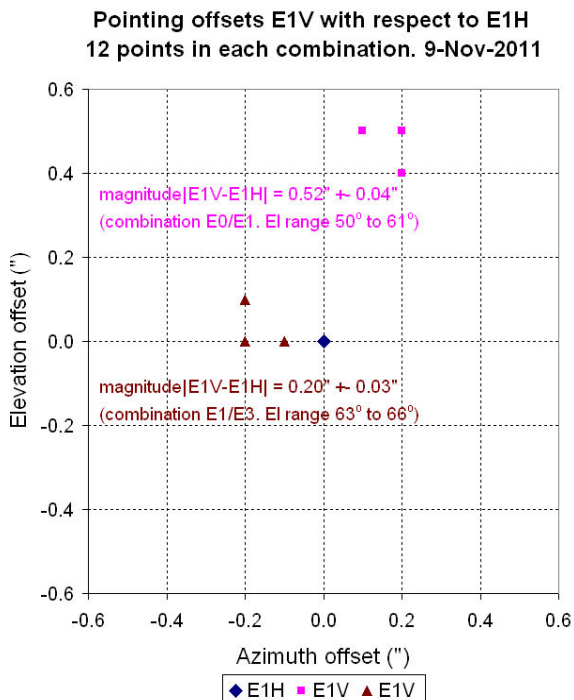
The magnitude of the E0V pointing correction with respect to E0H is  $0.21'' \pm 0.07''$ . The result of the measurements is shown in the graphic below.



The axial focus difference of E0V with respect to E0H has been  $0.01 \pm 0.03$  mm.

### Alignment between both E1 polarizations

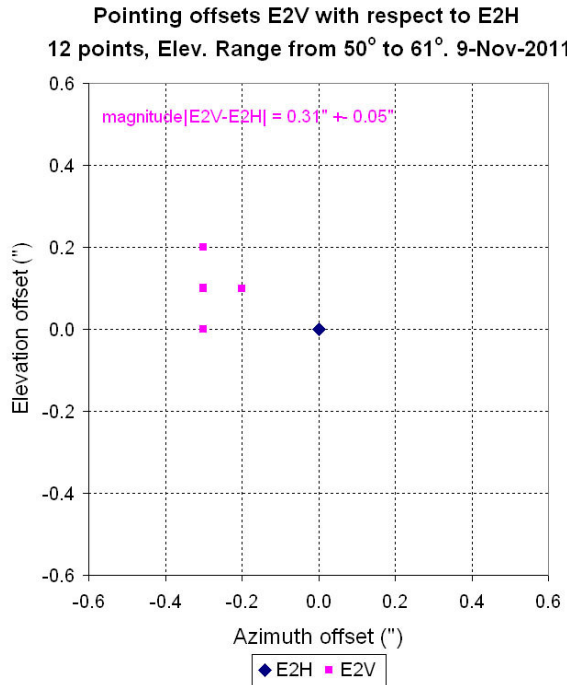
The magnitude of the E1V pointing correction with respect to E1H is  $0.52'' \pm 0.04''$  in the combination E0/E1 and  $0.20'' \pm 0.03''$  in the combination E1/E3. The result of the measurements is shown in the graphic below.



The axial focus difference of E1V with respect to E1H has been  $0.02 \pm 0.01$  mm in the combination E0/E1 and  $-0.03 \pm 0.01$  mm in the combination E1/E3.

### Alignment between both E2 polarizations

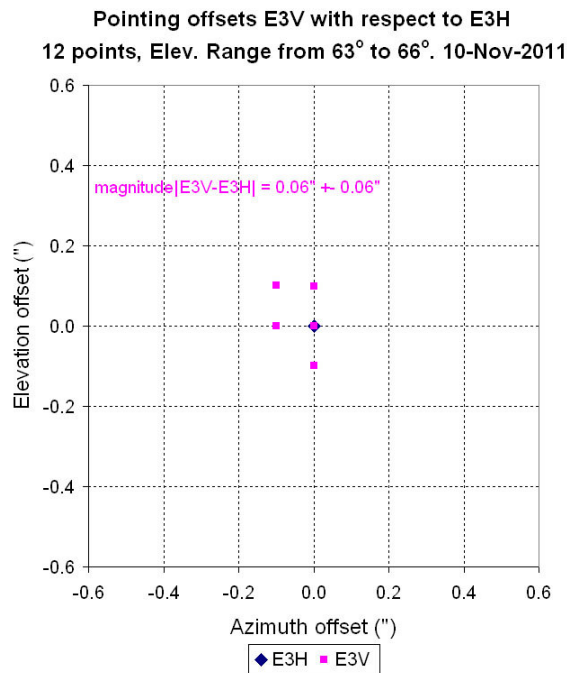
The magnitude of the E2V pointing correction with respect to E2H is  $0.31'' \pm 0.05''$ . The result of the measurements is shown in the graphic below.



The axial focus difference of E2V with respect to E2H has been  $0.01 \pm 0.00$  mm

### Alignment between both E3 polarizations

The magnitude of the E3V pointing correction with respect to E3H is  $0.06'' \pm 0.06''$ . The result of the measurements is shown in the graphic below.



The axial focus difference of E3V with respect to E3H has been  $0.01 \pm 0.01$  mm.

## Spikes observed on E3V

During the pointing scans observation sometimes spikes have appeared in the pixel E3V and only in that pixel. An example of the worse cases is shown below.

