



Al Conrad <aconrad@lbto.org>

I: R: Strange features on CRED2

1 message

Jacopo Farinato <jacopo.farinato@inaf.it>

Tue, Jan 17, 2023 at 2:27 PM

Reply-To: jacopo.farinato@inaf.it

To: Patrick Hartley <phartley@lbto.org>, jprothro@lbto.org, Joe Ornelas <jornelas@lbto.org>, James Riedl <jriedl@lbto.org>, Al Conrad <aconrad@lbto.org>, jhill@lbto.org, Mark Smithwright <msmithwright@lbto.org>, Jacopo Farinato <jacopo.farinato@inaf.it>, Maria Bergomi <maria.bergomi@inaf.it>, Elena Carolo <elena.carolo@inaf.it>, Luigi Lessio <luigi.lessio@inaf.it>, Luca Marafatto <luca.marafatto@inaf.it>, Davide Ricci <davide.ricci@inaf.it>, Fulvio Laudisio <fulvio.laudisio@inaf.it>, Gabriele Umbriaco <gabriele.umbriaco@unipd.it>, "Di Filippo, Simone" <simone.difilippo@inaf.it>

Thanks a lot John (and thanks James)! We do have a thread with "first light" (the company providing the C-RED2, our technical camera) on this topic, that I am forwarding you and, accordingly to what they say, having the coolant a few degrees above ambient temperature would decrease the probability to have condensation frosting on the glass (input window of the camera).

Anyhow, this problem seems to happen only when we set the detector temperature at -40deg C, while we normally use the camera at -15 (but with very faint objects), and it also seems that there is a solution that can be implemented to avoid this problem, and they are willing to do it on our camera.

Thus, we will probably use the camera at -15deg C throughout the commissioning and, at the first maintenance, we can replace the C-RED2 with its spare (which has been bought last year and received in April 2022, and it should have such upgrade already implemented) and ship the one currently installed to First Light to implement such solution.

Thanks again and ciao!

Jacopo

Da: Aurélien Le Fèvre [mailto:aurelien.lefevre@first-light.fr]**Inviato:** martedì 17 gennaio 2023 14:20**A:** jacopo.farinato@inaf.it**Cc:** 'Luca Marafatto'; 'Elena Carolo'; 'Davide Greggio'; 'support'; 'Laudisio, Fulvio'; 'Philippe Feautrier'; Luigi Lessio; 'Gabriele Umbriaco'; 'Bergomi, Maria'**Oggetto:** Re: R: Strange features on CRED2

Hello M. Farinato,

Condensation can happen when a surface is significantly colder than the atmosphere it is in contact with, prompting water to condense on it. Increasing the cooling fluid temperature will increase the camera glass temperature, minimizing the risk of condensation happening. This graph was computed theoretically, from measures of the glass surface's temperature with regards to the cooling fluid temperature and the partial pressure equations for air and water. Additionally, here the specific problem is frost. From our observation, condensation does not impede the sensor's sensitivity. Frost, however, does. As such, increasing the temperature will result in less chance of water freezing on the glass, which leads to the issue you have experienced.

Thus, your observation is correct. It seems counterintuitive, but passed a certain threshold in humidity level, the cooling fluid temperature needs to be set higher than the ambient temperature.

The sensor T at which the glass temperature measurements were taken seems to be -40°C. I will double check with the person who made the measurements, and will update you if they correct me (they are not available at the moment). The behavior should vary a bit depending on the configured camera sensor. I would think, however, that it would have much

less of an impact than the cooling fluid temperature (in addition to modifying the sensitivity and QE curves).

Best regards,

Aurélien Le Fèvre, PhD

Application Engineer

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Le 17/01/2023 à 13:16, Jacopo Farinato a écrit :

Dear Matthieu, if I understand correctly the graph you sent and your explanation, to increase the ambient humidity range in which we mitigate the risk of condensation, we should increase the cooling fluid temperature, which looks a little strange to me. If I would set the cooling liquid T at 4-5 degrees above ambient T, I would always have to consider the 80% humidity curve, is that correct?

Second, does the graph refers to a particular camera sensor T? I guess the behavior should depend not only on the cooling liquid T but also on the camera sensor T that we set (0, -15, -40 deg)...

Thanks a lot and have a nice day...

Jacopo

Da: Matthieu Florentin [<mailto:matthieu.florentin@first-light.fr>]

Inviato: venerdì 13 gennaio 2023 16:25

A: Bergomi, Maria

Cc: Luca Marafatto; Elena Carolo; Jacopo Farinato; Davide Greggio; support; Laudisio, Fulvio; Philippe Feautrier

Oggetto: RE: Strange features on CRED2

Dear Maria,

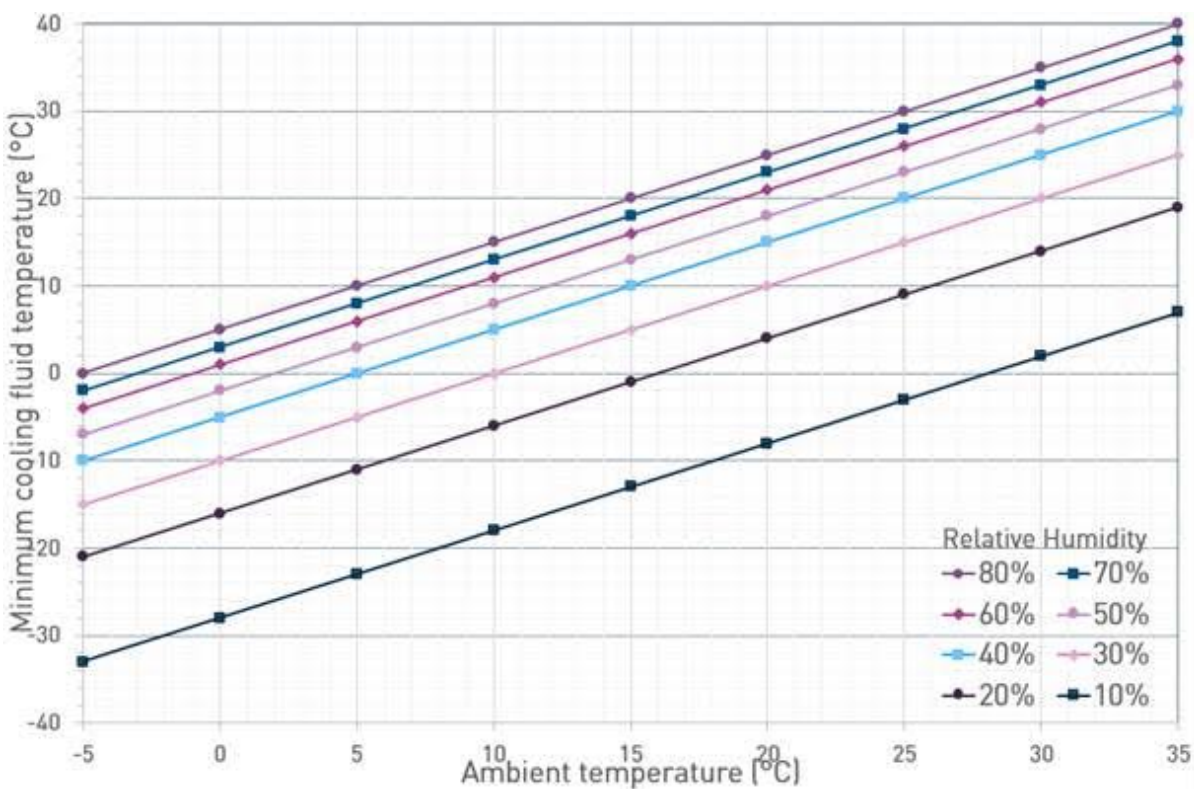
Unfortunately, we do not have any test data to share, because frost issue is camera-dependent and did not occur on all camera from a same generation. According to the data you sent, operating the camera's sensor at -25°C might induce frost. Furthermore, it is not clear to us if frost appeared either on the sensor's windows or on the camera's windows.

Nevertheless, if you can control the cooling liquid temperature, there is a procedure that is worth trying :

1. Cool the camera's sensor down to -25°C (with chiller enabled).
2. Make the camera operate for a few hours.

1. If frost appears, try to decrease the chiller's cooling temperature liquid, and see if the frost disappears. Decrease the cooling liquid temperature as far as the frost exists.
2. If despite of all, frost does not disappear, increase the sensor temperature until frost disappear.
3. If frost still not disappear, the only way to make it disappear is to increase the sensor's temperature.

In addition, let me share with you the graph below, providing references for the minimum cooling liquid temperature with regards to ambient temperature and humidity to avoid frost on camera's external window.



To illustrate the graph let me show you an example : If my ambient temperature is about 20°C and my cooling fluid temperature is about 10°C, I need the humidity room to be lower than 30% to avoid any risk of condensation on the camera's window.

I hope it helped.

Cordialement / Kind regards

Matthieu Florentin, PhD

Application Engineer

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De : Bergomi, Maria <maria.bergomi@inaf.it>

Envoyé : vendredi 13 janvier 2023 11:55

À : Matthieu Florentin <matthieu.florentin@first-light.fr>

Cc : Luca Marafatto <luca.marafatto@inaf.it>; Elena Carolo <elena.carolo@inaf.it>; Jacopo Farinato <jacopo.farinato@inaf.it>; Davide Greggio <davide.greggio@inaf.it>; support <support@first-light.fr>;
Laudisio, Fulvio <fulvio.laudisio@inaf.it>; Philippe Feautrier <philippe.feautrier@first-light.fr>

Objet : Re: Strange features on CRED2

Dear Matthieu,

thanks for your answer.

We are always using Cred2 with liquid cooling at the telescope, so this part will not be and issue.

Do you have more data to understand at which temperature the frost issue can appear? And, in general, if It leaves behind any problem, After having happened? If operating the camera at -25, based on your tests, Is It likely frost to happen?

Perhaps a videocon to discuss a bit the subject would be very useful.

Removing the camera before installation on the telescope in october 2022 and replacing It with out spare one (newest generation) would have been the best solution, but we were not aware of any issue and did not experience any since in laboratory we mostly operated the camera at -15C.

Now we carefully have to evaluate all pros and cons before taking any decision.

Thanks again,

Maria

Il ven 13 gen 2023, 10:49 Matthieu Florentin <matthieu.florentin@first-light.fr> ha scritto:

Dear Maria,

Working with a C-RED 2 at -15°C should not induce any frost issue as long as you are using a liquid cooling system.

The camera CR2-2018-037 belongs to a first generation of C-RED 2 that is not equipped with the last mechanical technology allowing to avoid frost.

The frost issue is indeed related to the camera use at -40°C. This issue has been identified at First Light Imaging and a solution to avoid it has been implemented into our last generation of C-RED 2.

If you agree and when you request it, we can provide you an RMA document for camera return, we will upgrade your C-RED2 to the last mechanical technology.

Of course, this operation is entirely covered by First Light Imaging warranty, and will be free of charge for you.

Cordialement / Kind regards

Matthieu Florentin, PhD

Application Engineer

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De : Maria Bergomi <maria.bergomi@inaf.it>

Envoyé : jeudi 12 janvier 2023 11:33

À : Matthieu Florentin <matthieu.florentin@first-light.fr>; luca.marafatto@inaf.it

Cc : elena.carolo@inaf.it; jacopo.farinato@inaf.it; davide.greggio@inaf.it; support <support@first-light-imaging.com>

light.fr>; Laudisio, Fulvio <fulvio.laudisio@inaf.it>; Philippe Feautrier <philippe.feautrier@first-light.fr>
Objet : Re: Strange features on CRED2

Dear Matthieu,

following previous conversation, here is the serial number of the camera: CR2-2018-037.

It would be extremely important for us to know more of the issue you seem to have identified on our Cred2 camera, given it is installed onto an instrument installed onto a large astronomical telescope and its removal is certainly not an easy task.

As in the last email I forwarded, the camera is now working fine. Do you think the frost issue can be related to the camera use at -40°C for several days in a row? It is now at -15°C and behaving properly since many hours. We might need to evaluate pros and cons on having to use it on a limited ranges of temperature (if that would prevent the frost issue fro happening) vs removing it from the instrument.

Today is the last day the instrument will be observing on the telescope and that some of the SHARK-NIR team members are on the summit, but we are able to perform any needed tests/checks remotely in the next days/weeks, but of course not to remove it.

Thanks again,
Maria

Il 12/01/2023 10:47, Maria Bergomi ha scritto:

Dear matthieu,

I will forward you the email following the one from luca, in case you have not received them. For completeness of information, the C-red2 camera in installed on the Large Bincour Telescope in Arizona in a working astronomical instrument.

Maria

Il 12/01/2023 10:44, Matthieu Florentin ha scritto:

Dear Mr Marafatto,

Your camera is facing a frost issue. You need to return it to First Light Imaging.

Can you provide us your camera's serial number that I can provide you the RMA document ?

Cordialement / Kind regards

Matthieu Florentin, PhD

Application Engineer

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De : Marafatto, Luca <luca.marafatto@inaf.it>
Envoyé : mercredi 11 janvier 2023 12:58
À : Cécile Brun <cecile.brun@first-light.fr>; Stephane Lemarchand <stephane.lemarchand@first-light.fr>; Philippe Feautrier <philippe.feautrier@first-light.fr>
Cc : Jacopo Farinato <jacopo.farinato@inaf.it>; Elena Carolo <elena.carolo@inaf.it>; Maria Bergomi <maria.bergomi@inaf.it>; Davide Greggio <davide.greggio@inaf.it>
Objet : Strange features on CRED2

Dear all,

we recently had the first light (ahah) of SHARK-NIR at LBT. As you might remember, we have a CRED2 camera in our instrument, which serves as a fast loop camera.

Everything worked fine till yesterday, when we noticed a strange shadowing on the images of CRED2.

I attached a picture of these features. They look quite in focus, so our fear is that it is something on the detector.

We have been using the detector at T -40°C for a few days and the camera has been running for several days.

Do you have any clue on what those features might be? Could it be damage to the detector?

Thank you!

Best Regards!

Luca

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e-mail: luca.marafatto@inaf.it

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