

A short briefing on false (illegal colors) and solutions to get rid of

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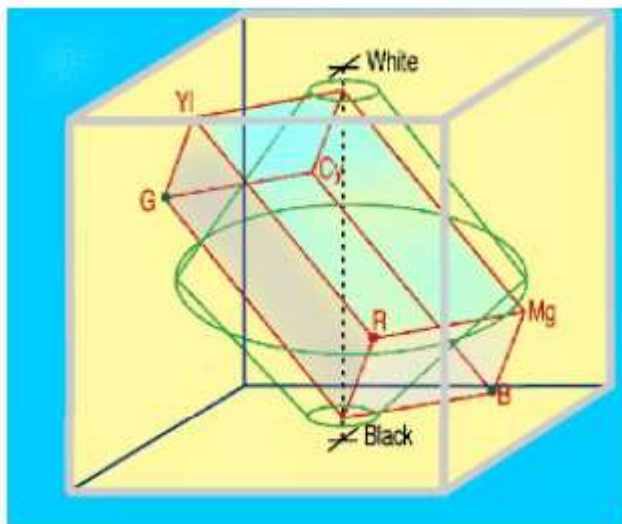
What are false colours and how do they appear?

Colour television is obtained by means of 3 primaries Red, Green and Blue (RGB). For proper rendition in analogue form, RGB signals must be positive and inferior to 700mV. Since Television represents the process to transmit the RGB signals from one source (example the camera) to one or many display devices (example the TV Set), it is necessary that the limitations on RGB amplitudes shall apply all along the chain.

For a lot of practical reasons, transmission and nearly all false colours corresponding to negative RGB will appear Black, and those corresponding to positive RGB will appear clipped.

However, they will be nearly undistinguishable except by comparison with the original picture.

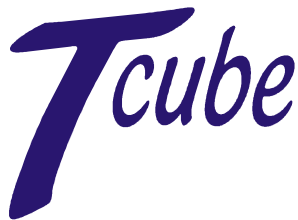
On the other side, the limitations [64-940] involved by ITU Rec 601 and 656 on Y-Cb-Cr signals represent the equations of a cube in the [Y,Cb,Cr] domain, cube which includes the transformation of the RGB cube (see figure). **The situation is the same with SD or HD signals.**



By definition, false colours are the Y-Cb-Cr subsets transformation of the original RGB cube. These subsets, if dematrixed, lead to either negative RGB or RGB superior to 700mV. **If you work with natural scenes taken from a camera or a telecine, and assuming that your chain is properly aligned, you cannot obtain false colours. (Have you ever heard about a sensor able to retain energy?) But as soon as you enter the [Y,Cb,Cr] domain, you have the highest probability to generate false colours in a way or another. Note that this can even be done with the simplest devices such as amplifiers with saturation control!!!**

Graphics devices (palettes, ...) are also big potential generators not to speak about Mixer Background generator, ...

Conclusion: Even with the greatest care, it is quite impossible to avoid the generation of false colours in a video signal. This problem is more acute in the digital domain since the headroom for amplitudes outside theoretical values is very limited.



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Can I see false colours on a monitor?

No, you can't unless using a specific digital to analogue converter which detects and displays them!! To see false colours i.e. negative RGB, means that your display should absorb light from the room instead of generating it!!! Consequently false colours corresponding to negative RGB will appear Black, and those corresponding to positive RGB will appear clipped. However, they will be nearly undistinguishable except by comparison with the original picture.

Are False Colours dangerous or is it a fashion effect?

Fighting against false colours is part of the overall quest for quality and reliability. In that sense it is definitely not fashion effect since we all know that better quality products are, at the end, less expensive.

I often compare false colours with nuclear radiations:

- nukes are very difficult to detect, so are false colours,
- nukes have long term effects, false colours may cause disasters in apparently simple downstream processes

False colours effects may reveal in process as obvious as NTSC or PAL Encoding, generating chroma modulation that could exceed sync pulse,... Imagine how troublesome and costly that would be if you have to hide and correct a few seconds in a production of one hour. Who will pay for the extra work and the delay??

Since false colours are quite impossible to avoid in digital Television, the safest way to protect against them is to install 'firewalls' each time the signal leaves the Production/Post production suite and between specific devices which have proved to be sensitive to false colours. The FIG/CO range of Tcube is perfectly suited to that purpose. While featuring a 100% removal of false colours, it is absolutely transparent to correct signals.

I never had any problem in my installation with false colours, can you comment ?

Well, either you have already installed firewalls in your installation or you are very lucky!! However the better understanding of the problem will lead to tighter recommendations from your customers which could cause problems to your productions in the future. I would then recommend that you update your installation as soon as possible.

I want to take care of the problem, how can I solve it?

You need to partition your installation to insert devices such as **FIG/CO479** from Tcube to remove false colours. In any case, always put FIG/CO before the final mastering.

Install measurement devices able to detect the presence of false colours, that will help you in the installation phase to determine where to implement firewalls, later on to check performances of your installation and to see if false colours are strictly confined.