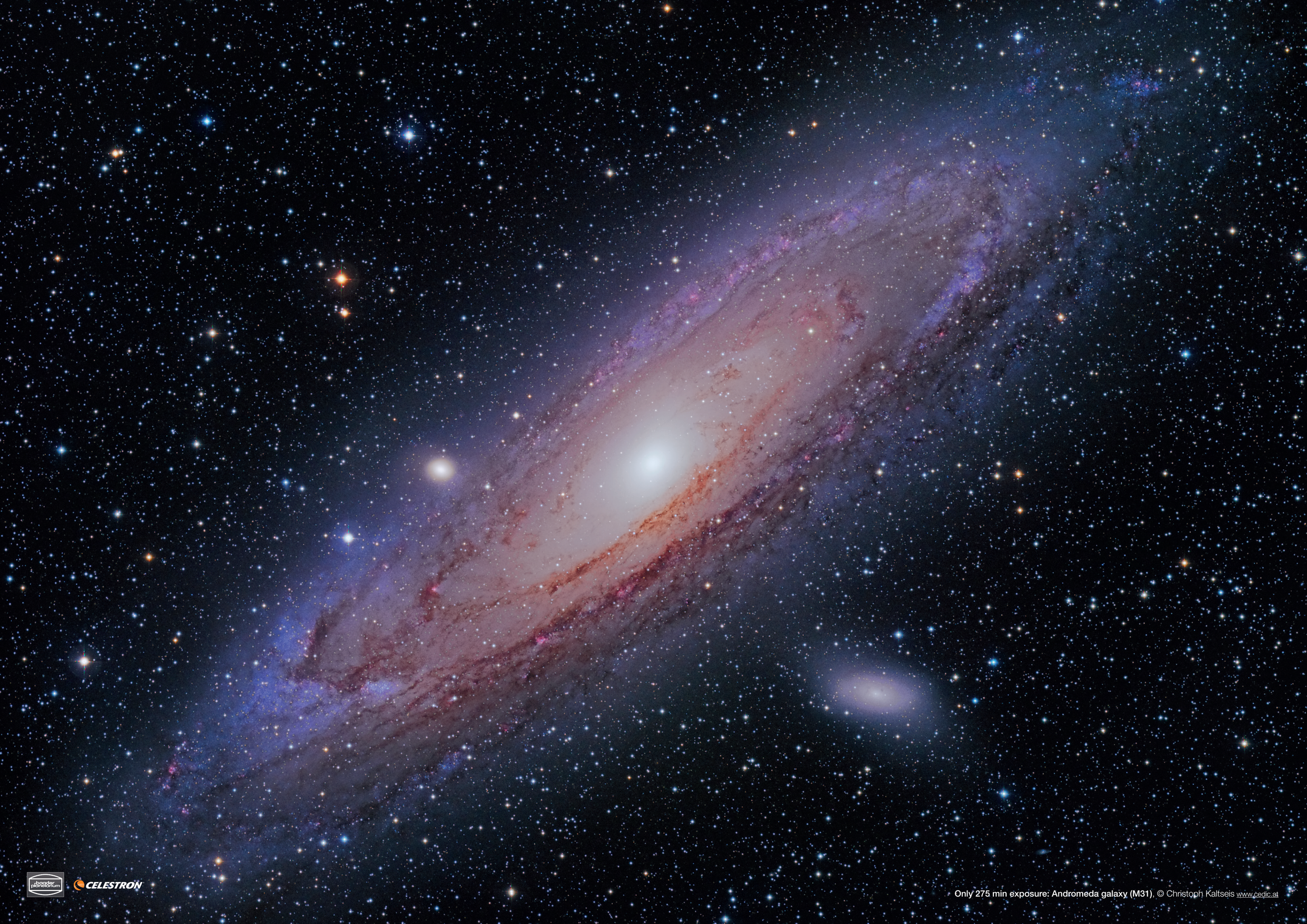


Only 275 min exposure: Andromeda galaxy (M31), © Christoph Kaltseis www.cedic.at

THE STORY: M31 in only 4,5 hours

“The Andromeda galaxy is an object seen by every amateur astronomer, either with own eyes or in as an image. I was particularly fascinated to image our magnificent neighboring galaxy with the RASA 8" f/2.0 Schmidt-camera under a perfectly dark sky. This was one of the reasons why my way led me to La Palma for one week in October 2019, to do my images at the Athos Centro Astronómico

www.athos.org

The QHY 163M camera is a perfect fit on the RASA 8" in terms of field size and pixel scale for M31. For a monochrome camera, the Baader FCCT (Filter Changer & Camera Tilter) was a very important accessory. This special development of a filter changer for the short backfocus of the RASA 8" not only allows a quick exchange of the different filters, but also a sensitive and stable adjustment of the camera against tilting. I used my proven LRGB and UHC-S Baader filters, but added the very first prototypes of the upcoming new Baader f/2 ULTRA-Highspeed Narrowband Filters: H-alpha and O-III.

Final preparations: Every optical surface must be clean for the highest possible contrast

Ready for the night: Camera, heating tape and autoguider at the telescope.

After arriving with this instrumentation on La Palma, I was able to set up everything on the first day and was ready to take the raw images of M31. During the setup I paid special attention to the position of the USB- as well as the power cable, which were connected to the QHY-camera. Therefore I led both cables as exactly as possible in a 90° angle in front of the optics to the outside. I fixed the cables with the dew cap heating tape. By this careful preparation I was able to ensure that in the final images beautiful and fine spikes around bright stars could be achieved, which are otherwise only known from reflecting telescopes with high-quality secondary mirror spiders.

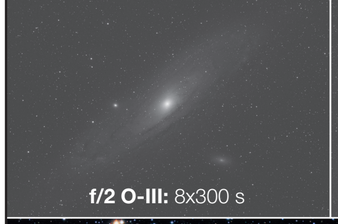
In the first clear night I could already start with my project. Via the FCCT the system was perfectly adjusted very quickly, for sharp stars right to all four edges. With every filter change I focused again to get the maximum signal with perfect image quality for every shot. My goal was always to get the most out of M31. The new ULTRA Highspeed filters (coming soon) were a very important help for this, to be able to display the depth of color in the galaxy. (...)

All single images were measured in PixInsight and evaluated regarding FWHM, roundness and signal. I registered all subframes on the best single frame. So I could collect a total of 275 min exposure time at f/2.0, which would correspond onto 550 min at f/2.8, 1100 min at f/4 and 2200 min or 36.6h at f/5.6!

(...) From my point of view the effort and the strict selection of the data paid off. 275 min exposure time and 400mm focal length, with a very handy and absolutely focus-stable lens – who would have thought this before?!”

Careful cable routing avoids unwanted spikes on the pictures.

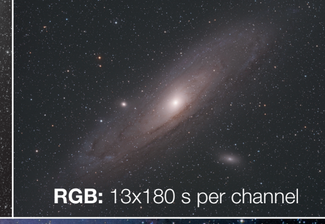
The complete report by Christoph Kaltseis with much more information – especially about the processing of the individual images and thus the composition of the final image – can be found at www.baader-planetarium.com/en/m31



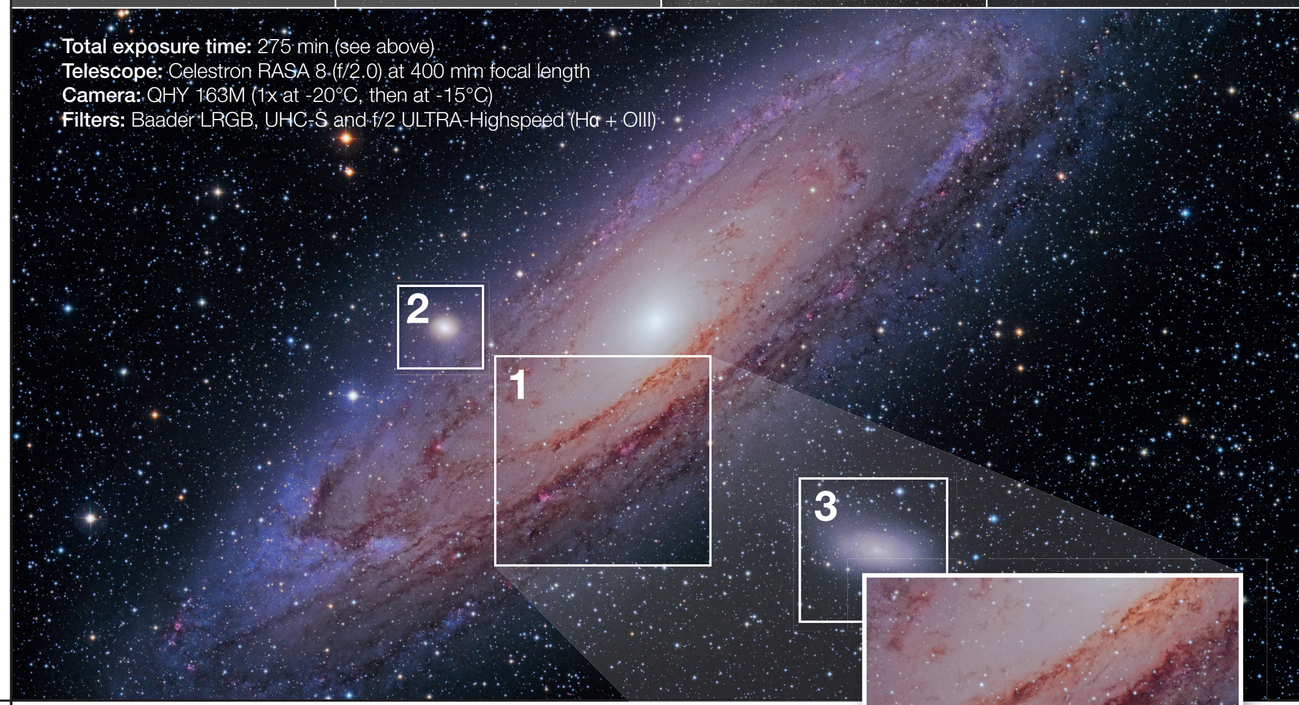
f/2 O-III: 8x300 s

f/2 H-α: 8x300 s

UHC-S + L: each 13x180 s



RGB: 13x180 s per channel



THE EQUIPMENT: Perfectly matched

The vast Andromeda galaxy is ideal for the RASA 8" with 400 mm focal length and a camera with Micro-Fourthirds sensor. With a weight of almost 7.7 kg the telescope is very easy to transport. For this picture an exposure series was made (see top right). The stars are sharp up to the edges – for this amount of sharpness a fast camera lens would have to be stopped down.

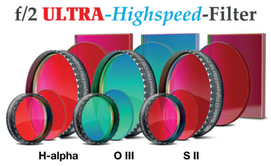
Celestron RASA 8" f/2,0 Schmidt-Astrograph

The Rowe-Ackermann Schmidt-Astrograph (RASA) transfers the concept of the fast Schmidt-Camera into the digital age: The camera is mounted at the primary focus of the telescope, a corrector ensures a flat field of view. Thus, with the 8" RASA at 400 mm focal length and 203 mm aperture a very compact and high-quality f/2 astrograph could be built. Since the RASA is based on the Schmidt-Cassegrain design, the price is also very attractive.

QHY 163M Camera with Baader FCCT

The QHY 163M is a cooled CMOS camera with Micro-Fourthirds Sensor. Its compact, lightweight housing is ideal for digital Schmidt cameras where it sits in front of the lens. The monochrome sensor is sensitive across the entire spectrum and shows exceptionally good sensitivity for the finest brightness gradations. Together with the appropriate filters, colour photos with very short exposure times are possible. With the soon available short Baader FCCT (Filter Changer & Camera Tilter) the filters can easily be exchanged and above all the image position of the QHY camera can be adjusted on the fly from the side, while mounted at the telescope, without any problems.

Baader f/2 ULTRA-Highspeed Filter



At an aperture ratio of f/2, normal narrowband filters no longer work. Due to the extremely oblique incident light cone, with entrance angles of 0 degrees (image center) to 14 degrees (image edge), the filter coating technology is at its very limit. The upcoming new Baader f/2 ULTRA-Highspeed filters are designed for fast astrographs with aperture ratios between f/1.8 and f/3.5. They will become available for the wavelengths H-Alpha, S-II and O-III in all standard dimensions. With such filters the colors in the star forming regions, e.g. here of M31, can be displayed without any vignetting and with full S/N-ratio.

THE OBJECT: Andromeda galaxy (M31)

With a diameter of about three degrees or six full moon diameters our nearest neighboring galaxy is actually a target for binoculars. This is because most telescopes show only their bright, structureless core; it exceeds the field of view of many larger telescopes. Good binoculars with a somewhat higher magnification already clearly show the dust bands between the spiral arms.

1. The spiral arms of M31 appear due to the common glow of countless comparatively young star clusters. The area between them is filled up with dust and inconspicuous single stars similar to our Sun. By using very narrowband nebula filters, the red shimmering gas masses of star forming regions are also clearly visible.
2. The small companion galaxy M32 seems almost fading next to the magnificent Andromeda galaxy. With about 100 million solar masses, it is comparable to the core of M31. It is a typical elliptical galaxy dominated by older red stars and contains hardly any gas and dust.
3. M110 is the larger companion of the Andromeda galaxy and twice as large as M32. A total of eight globular clusters could be assigned to this dwarf galaxy, which, with a distance of about 2.7 million light years (Ly) from the sun, is still behind M32 (2.5 million Ly) and M31 (2.54 million Ly).

THE AUTHOR: Christoph Kaltseis

Christoph Kaltseis is not only an Adobe Photoshop specialist and as Nikon Professional on tour for Nikon, but also an experienced astrophotographer. He is one of the founders of the Central European DeepSky Imaging Conference (www.cedic.at), which is held regularly every two years in Linz (Austria) since 2009.

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