DARK SKY METER

*A short review by Steve Richards*

Image of the Galaxy M31 before and after removal of light pollution

Astronomers are acutely aware of the problem of light pollution as this unpleasant by-product of our modern 24 hour day society robs our skies of their natural beauty. We can, of course, travel to darker locations for our observing sessions or use expensive light pollution filters to help combat the menace but as with so many problems, it is always better to resolve the issue at source. But, before we can do that, we need to quantify the problem and the Dark Sky Meter project developed by an independent software company (DDQ) in the Netherlands in co-operation Zetmedia, amateur astronomers, scientists and staff from the International Dark Sky Association (IDA) aims to do just this.

By collecting and collating light pollution data from around the World, the IDA will be in a stronger position to apply pressure on governments, local authorities and companies to manage their light output and preserve the night for this and following generations.

Special light measuring devices have been available for some time but these can be fairly expensive and certainly out of reach for general educational purposes but the developers at DDQ and Zetmedia have produced a light meter App that works with the iPhone at a very reasonable cost of £2.49. However, with educational purposes in mind, they have also released a cut-down, free version so that anyone can get involved in data collection at no cost if they have access to an iPhone.
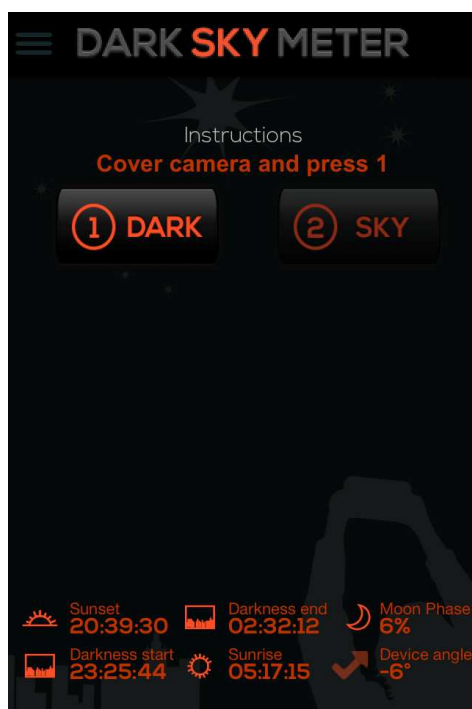
The paid for 'pro' version produces two number results from a sky test; a Sky Quality Meter (SQM) number which claims to be a close equivalent to that produced by the Unihedron Sky Quality Meter and a Naked Eye Limiting Magnitude (NELM) figure.

Collecting the data is very simple, just cover the iPhone's camera to exclude any light and press the 'DARK' button to calibrate the instrument. After a few seconds, the iPhone will vibrate to indicate that the calibration has completed and you will be prompted to press the 'SKY' button to record the light level of your sky. The sky reading is taken with the camera side of the iPhone pointing straight up at the zenith and again, following a quick vibration notification, the SQM and NELM figures will be displayed along with a description of the conditions at your location.

As well as collecting the light level data, your location (via the built in GPS receiver), date and time, Moon phase, device angle and optional cloud description are also stored and you can choose to submit this data to the developers for inclusion in their map resource. Currently this map is only available to view via the iPhone App itself but it will be available on the Internet in the future as well. A small table of all your own submitted data remains available on your iPhone for future reference.
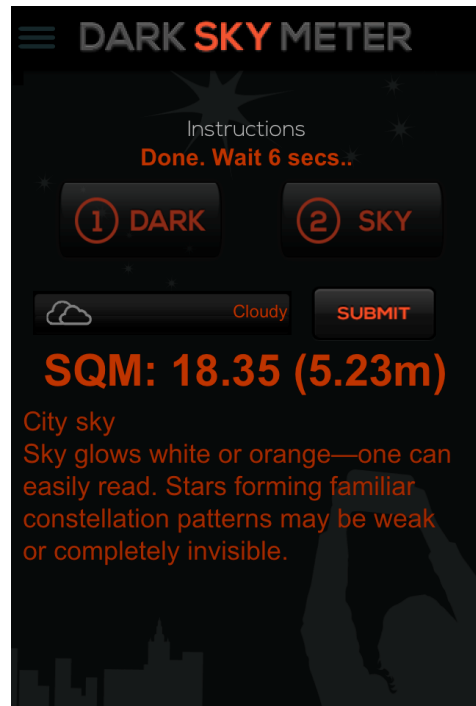
| product	datetime	latitude	longitude	moonperc	clouds	device_type	device_angle	device_sqm
Lite	19-04-13 15:12	50,01	8,77	60	Cloudy	iPhone4,1	-3	13,97
Pro	19-04-13 11:18	39,83	-74,92	61		iPhone5,2	-7	14,75
Lite	19-04-13 22:28	28,45	77,04	62	Clear	iPhone3,1	-8	16,68
Lite	19-04-13 19:56	50,99	4,72	62	Mostly Cloudy	iPhone5,2	67	14,77
Lite	20-04-13 01:08	10,84	106,73	62		iPhone3,1	66	17,91
Lite	19-04-13 21:09	50,92	5,98	62		iPhone5,2	-5	15,61
Lite	19-04-13 21:20	0	0	62		iPhone4,1	-2	14,08
Lite	19-04-13 20:58	52,48	1,7	63	Clear	iPhone3,1	10	17,62
Lite	19-04-13 22:16	52,05	4,25	63	Clear	iPhone4,1	73	17,28
Lite	19-04-13 22:22	50,31	8,27	63	Cloudy	iPhone4,1	91	18,62
Pro	19-04-13 22:27	57,55	12,44	63		iPhone4,1	71	20,16
Lite	19-04-13 22:36	52,01	5,03	63		iPhone4,1	54	18,08
Lite	19-04-13 22:36	52,01	5,03	63		iPhone4,1	61	18,71
Pro	19-04-13 22:42	52,02	5,24	63		iPhone3,1	61	18,94
Lite	19-04-13 22:45	46,84	-0,49	63		iPhone3,1	13	16,07
Lite	19-04-13 23:02	41,54	2,12	63		iPhone3,1	-7	18,44
Lite	19-04-13 23:29	53	6,55	63	Clear	iPhone5,2	76	18,76
Lite	19-04-13 23:30	54,55	18,45	63		iPhone5,2	94	18,28
Lite	19-04-13 23:54	50,99	4,72	63		iPhone5,2	63	18,95
Pro	20-04-13 00:05	50,99	4,72	64	Clear	iPhone5,2	93	19,45
Pro	20-04-13 00:08	52,65	13,55	64		iPhone4,1	46	18,59
Pro	14-04-13 22:46	50,81	5,98	18		iPhone4,1	65	19,88
Lite	20-04-13 06:38	0	0	64		iPhone5,2	-6	20,72
Pro	20-04-13 00:45	49,05	12,08	64		iPhone4,1	94	16,77
Lite	20-04-13 01:21	52,05	5,26	64		iPhone5,2	-8	19,89
Lite	20-04-13 07:40	10,84	106,73	65		iPhone3,1	8	14,64
Lite	20-04-13 07:41	10,84	106,73	65	Some Clouds	iPhone3,1	-3	14,87
Lite	19-04-13 21:48	46,09	-64,78	65	Some Clouds	iPhone4,1	68	16,76
Lite	20-04-13 11:36	35,48	136,81	65		iPhone3,1	23	15,81
Pro	19-04-13 21:42	34,04	-118,46	66	Clear	iPhone5,1	61	17,16
Pro	20-04-13 00:05	37,12	-93,35	66	Clear	iPhone5,1	-8	17,78
Lite	20-04-13 07:30	51,08	5,07	67	Clear	iPhone5,2	-4	15,01

**Examples of data submitted to the developer's database**
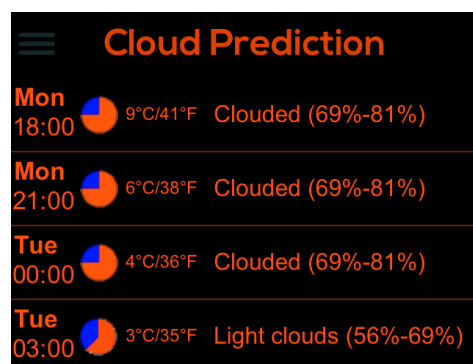
In addition to the collection and viewing of data and maps, the App also incorporates a cloud prediction table for the next 4 days ahead, information about the IDA and a very simple Help menu which you won't need as operation is very simple and obvious!

The free of charge 'Lite' version works in exactly the same way as the full version and it too allows you to submit data for inclusion in the World map and it is hoped that much of the

data submitted will originate from educational resources using this version. Unfortunately for astronomers with a particularly keen interest in this subject, the free App only displays the light value as a descriptive text and an '*XX number of times brighter than a natural clear sky*' figure. Although undoubtedly useful for comparing the light values at different locations, this does not give a recognised figure to work with. However, the calculated SQM value is included in the data submission so using this version of the App will still contribute substantially to the database, which is to the advantage of us all if it helps to reduce light pollution in the future.
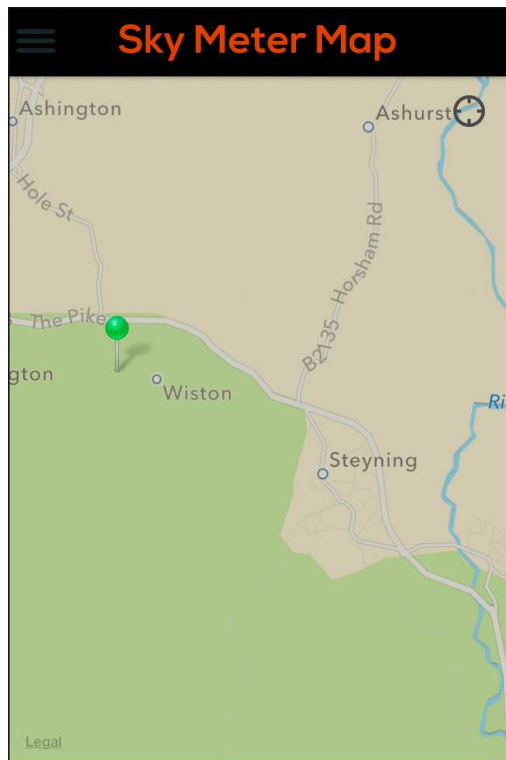
My submitted data pin
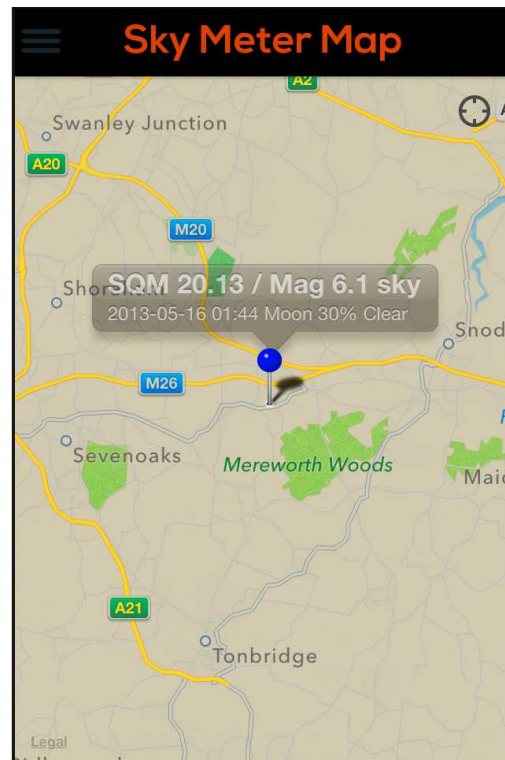
A typical set of data attached to a pin

The App worked very well giving reasonably consistent results although the algorithm used to calculate the NELM (***NELM = ((SQM - 8.89) / 2) + 0.5***) is perhaps a little over-optimistic based on observed results by experienced observers such as John Taylor from the Stargazers Lounge (http://stargazerslounge.com).

This App will no doubt be compared with stand-alone light meters like the classic Unihedron SQM. If you have access to one of these, you can, apparently, calibrate your App to achieve readings that closely match those of the SQM. However, you do need to bear in mind that the SQM has a field of view of 80° against the 10° of the iPhone App so a true comparison may not be completely valid.

The Dark Sky Meter is designed to work with the iPhone 4s and 5 but gives unreliable results with an iPhone 4 because of its relatively poor low light performance.

Now is the time to get involved in this interesting project!

Resources

Dark Sky Meter: http://www.darkskymeter.com
IDA: http://www.darksky.org/
DDQ: http://www.ddq.nl/en/index.html
Zetmedia: http://zetmedia.in
Unihedron: http://www.unihedron.com

Steve Richards is the author of '*Making Every Photon Count*' and writes for The Sunday Times, BBC Sky at Night Magazine and BBC Focus Magazine.