

Operations log for S-Pol for PRECIP 2022

2022/05/25 - Wednesday

Start of operations.

IOP called starting 00:00 UTC (08:00 local time).

S-Pol began 24/7 operations at 02:00 UTC (10:00 local).

S-Pol team worked on fine-tuning scan strategies.

Radar ran overnight without problems - a major milestone.

Some concern was raised about the oil pressure in the pedestal.

2022/05/26 - Thursday

IOP continued.

The second wave of personnel were released from quarantine.

Incoming connections to S-Pol from the internet were enabled via the cell modem.

Jeff Bobka recommended we check the oil flow to the azimuth transmissions.

This was completed in the evening.

2022/05/27 - Friday

IOP continued.

Mike took 2 display machines to the CWB ops center in Taipei.

2022/05/28 - Saturday

IOP ended at 00:00 UTC.

2022/05/29 - Sunday

Kina and Mike replaced the oil pump for the azimuth drives.

Radar was down from 01 to 03 UTC.

No substantial change in oil pressure.

2022/05/30 - Monday

18 hour IOP called, starting at 00:00 UTC.

Students ran the GUI.

2022/05/31 - Tuesday

Ops continued.

2022/06/01 - Wednesday

Maintenance 02 - 04 UTC.

Opened waveguide valves to purge moisture.

Klystron tuning - increased cavity 4 setting by 1 count.
This dropped the power by 0.1 dB.
Rise time increased to about 135 ns.
Spurs on spectra improved to about 60 dB down on the peak.
Tx powers H 84.35 dBm, V 84.48 dBm.
Performed new cals for sim mode.

Received reports of interference at CWB radar RCWF.
Moved RHI from 72 to 74 degrees. This seemed to help.

2022/06/02 - Thursday

Ting-yu and Ian joined us in the afternoon to control the scanning.
Sky camera times set to UTC at around 07 UTC on June 2.

2022/06/03 - Friday

Preventative maintenance on the pedestal and other systems.
Sam and Grant obtained more spectra on the transmit pulse.
Grant sent these to Eric in an email.
Solar scan from 07:12 to 07:24 UTC. Pedestal position looks good.

2022/06/04 - Saturday

Operating in unattended scan mode.

2022/06/05 - Sunday

Operating in unattended scan mode.
Radar down for maintenance from 01:36 UTC to 02:24 UTC.
Measured spectra for second harmonic from V and STALO.
STALO shows the second harmonic.

Scanning stopped at 03:48 UTC because of high winds.

Checked on the radar around 13:00 UTC. The winds have moderated somewhat.
Restarted unattended scan mode at 13:48 UTC.

2022/06/06 - Monday

IOP3 started at 06 UTC.
S-Pol operated continuously.
A Meiyu front passed the radar site around 10 UTC (6 pm local).
Heavy rain followed the passage of the front.
Wen-Chau and Mike stayed at the site until around 14 UTC (10 pm local).

2022/06/07 - Tuesday

IOP3 continued.

S-Pol operated continuously.

Ting-Yu and Ian operated the radar in the afternoon. Control then passed to the ops center at the CWB in Taipei.

Heavy rain continued. Over 180 mm of precip recorded in 24 hours at the incinerator site just NE of the radar.

2022/06/08 - Wednesday

IOP3 continued.

S-Pol operated continuously.

The radar was controlled remotely from the operations center at CWB.

Heavy rain events continue at the site and across Taiwan.

2022/06/09 - Thursday

IOP3 continued.

S-Pol operated continuously.

The radar was controlled remotely from the operations center at CWB.

Wen-Chau and Mike visited the operations center at CWB, to discuss operations with [Angela Rowe](#) and Shu-hua Chen. Shu-hua will take over as ops director after Angela.

We collected 2 laptops to have LINUX and CIDD installed for the ops center.

2022/06/10 - Friday

IOP3 continued until 06 UTC (2pm local).

S-Pol operated continuously until 05 UTC.

Routine weekly maintenance inspections were carried out on S-Pol from 05:00 to 08:00 UTC.

The operation of the azimuth motors was checked to ensure the servos are reasonably balanced. No changes were made to the servos.

The azimuth brake temperatures were measured at 120F for motor 1 and 110F for motor 2.

The dish temperature sensor at 315 deg was fixed.

Some testing was done on the Mitch Switch. The glitches only occur when RF is being transmitted through the switch.

The radar was restarted at 08:12 UTC.

Control was passed back to the operations center in Taipei at 08:20 UTC.

The radar was down between 08:47 and 10:06 UTC - WeMike accidentally tripped the servo-amp breaker while changing the USB drives, and it took us a while to diagnose the problem. The good news from that is there was not actual problem with the radar - just operator error. (We will add a guard to make the breaker less likely to hit by mistake.)

2022/06/11 - Saturday

IOP3 extended to 12 UTC June 12.

Precip forecast over the mountains in the afternoon, and perhaps over the water to the west.

The PIs have set the optional RHI angles to the default [188,194,199,204,210,216,50,55,64,69,78,82] starting 0024 UTC.

Changes will be made as needed depending on the region of precip development.

The transmitter power has been drifting slowly lower, at about 0.05 dB per day. It has dropped from 88.15 dBm to 79.95 dBm since 2002/06/01.

At 01:20 UTC we adjusted the PFM voltage on the transmitter to bring the measured power up from 79.95 to 88.27 dBm. We will monitor the drift.

The PIs visited the site in the afternoon, and we discussed scanning strategies.

Ian and Ting-Yu were on site to control the scanning.

2022/06/12 - Sunday

IOP3 in effect until 12 UTC (8 pm local time).

Interesting spectrum width signatures noted at 2022/06/12 01:00:00 UTC.

Stopped transmitter and scanning at 02:15 UTC to allow Chunghua Telecom to run fiber into the transmitter container.

Earlier we noted instability in the transmit power, seeing a change from 88.25 dBm to around 86.40 dBm, and back again. This is being investigated.

After the fiber installation was completed, we checked the Tx-drive power from the Stalo. It looked stable at 9.9 dBm.

We adjusted the PFM back to the previous setting - i.e. undoing the change from Sat morning.

Restarted operations at 03:48 UTC.

The transmit power was observed to cycle between 88.1 dBm and 86.4 dBm. We noted that the beam current (drive envelope) does not change during these events.

With Ting-Yu and Ian at the radar site, we set up preset RHI angles for RhiUser, to perform surveillance in unattended mode.

The radar was shut down at 13 UTC, one hour after the end of the IOP.

2022/06/13 - Monday

The morning was spent troubleshooting the instability in the transmitter, noticed over the past 2 days.

We contacted the NEXRAD hot line in the US for advice on the instability we were noticing in the S-Pol transmitter - we use a NEXRAD transmitter in S-Pol. Based on that advice we have worked through various checks on the transmitter. We focused our attention on 3 items upstream of the klystron: (a) the RF drive amplifier, (b) the pulse shaper and (c) a variable attenuator between the pulse shaper and the klystron.

Our measurements indicated that the output from the RF drive amplifier was stable. We found some instability in our initial measurements of the pulse shaper and variable attenuator. When we re-checked later on, the instability was less obvious.

For now we have replaced the variable attenuator with a fixed attenuator. The transmit power now appears to be stable. We are not sure if that stability will continue. But we do feel confident in running the radar even if the instability returns - i.e. it will not damage the transmitter. We make continuous measurements of transmit power so we can calibrate the reflectivity accurately even if the transmit power varies.

If we notice further instability, we will request a replacement pulse shaper from the NEXRAD maintenance center in the US.

We restarted operations at 06 UTC today, Monday 2022/06/13 - i.e. 14:00 local. We resumed scanning using the list of RHI angles that gives good coverage throughout the full 360 degree PPI.

The radar remained stable throughout the afternoon, with the transmit power at about 88.25 dBm.

2022/06/14 - Tuesday

(Log entry by Chris Burghart)

The radar was running well in the morning and was demonstrated to a local Hsinchu City TV crew. Upon their departure, we stopped the radar at 02:48 UTC for Grant Gray to insert a bandpass filter in hopes of diminishing a harmonic signal at 2x our licensed operating frequency, since the spur's power is too high for legal operation. He also increased power from the transmitter a bit to compensate for attenuation added by the filter, putting our current transmit power slightly under 88 dBm (compared to 88.2 dBm before).

Attempts were made to measure the new level of the harmonic, but were deferred when it was decided that the radar should start operating to capture developing weather. Grant and Dexter figured out issues with the way they were using the spectrum analyzer, and should be able to evaluate the filter pretty quickly when they try again, potentially tomorrow while we operate.

At 03:24 UTC, we started scanning in IOP mode. Operator error on my part gave us schedules that were off time and incomplete between 03:24 and 04:36. From 04:36 on, the radar worked without issue for the rest of the day. When NCAR staff departed the site, the radar was left available for remote operation so that PIs could continue to select custom RHI scan angles.

Chunghwa Telecom arrived at 16:30 local (08:30 UTC) to complete installation of our 1 Gbps fiber Internet connection. Working service was demonstrated at 17:30 local, and I will connect it to the S-Pol router as our main service tomorrow.

(Log entry by Grant Gray)

Prior to start of the IOP Dexter and I installed two Mini Circuits VBF-2900+ RF filters (in series) in the STALO transmitter drive input line. The TX Drive attenuator was carefully adjusted to bring us back to the previous Tx output (Pwr Top dBm) of nominally 88 dBm. We did a quick scan with the spectrum analyzer which indicated that the filters had eliminated the 2nd harmonic. We will check again tomorrow.

2022/06/15 - Wednesday

IOP4 was declared from 0 UTC on 2022/06/15 to 0 UTC on 2022/06/16.

The radar ran continuously throughout the day. Initially it was controlled by RSF staff. At noon Ting-Yu came to the radar and took control on behalf of the PIs.

A large area of precip moved onshore in a NE direction, during the morning, followed by a convective line. After a dry spell, a second region of precip approached the shore over night.

The fiber link was connected to the internet, with good results. We have around 600 MBit both upload and download. This is good news and will allow us much more reliability, and flexibility in transferring data.

2022/06/16 - Thursday

Although the forecast was for reasonably dry conditions, the day started with heavy rain from a line of storms crossing the coast at around 0 UTC.

The radar ran continuously throughout the day. Ian came out to the radar in the morning to control the scans, and was joined by Ting-Yu at lunch time.

The intermittent problem of instability in the transmit power recurred this morning. The technician team spent most of the day making various measurements to try to track down the problem.

It appears that it is most likely caused by the pulse shaper. We will take the radar down at 01 UTC tomorrow morning and spend 2 hours trying to track down the problem. At the same time we will measure the transmit spectra after the installation of the band-pass filters - added to reduce the power at the second harmonic.

2022/06/17 - Friday

Reasonably clear morning. A line of convection started forming to the SW of the radar site by 01:00 UTC.

In coordination with the ops director, we performed maintenance on the radar. We shut down at 01:24 UTC.

We had 2 aims:

- (a) Sample spectra to provide to the NCC.
- (b) Measure powers in the transmit system to ensure the levels are set correctly.

We were not able to complete (a), and needed to find out more about the FieldFox configuration.

For (b), we measured the powers at the following points:

- STALO Tx drive: 12.2 dBm
- After 2 bandpass filters: 6.6 dBm
- Input to the RF Driver: 2.5 dBm

The RF level into the RF Driver is listed in the manual as 10 milliwatts (10 dBm). We therefore set and checked the following power levels:

- STALO Tx drive: 13.6 dBm
- Input to RF Driver: 9.5 dBm
- Output from RF Drive: 48.5 dBm
- Output from Pulse shaper: 44.4 dBm
- Output from variable attenuator, into the klystron: 33.3 dBm

This operated the transmitter at 88.0 dBm at the top coupler.

We brought up the radar at 03:12 UTC in the updated configuration. We ran in that configuration until 09:00 UTC, at which time we shut down for the night because of arcing problems - see description below.

We first noticed 2 arc faults at 06:27:11 and 06:28:02 UTC. We adjusted the variable attenuator into the klystron to reduce the top power from 88.00 dBm to 87.75 dBm. A short while later we noticed further arc faults. So we reduced the top power reading to 87.00 dBm, i.e 1.0 dB below the level at which we had previously operated without any problems.

We noted another arc fault at 08:05 UTC. At that point we had a discussion internally, and then with the PI at the ops center in Taipei. We decided to shut down overnight to give us a chance to assess the situation and obtain advice on how to proceed from EOL and the NEXRAD hotline.

The scan was stopped and the transmitter put in standby at 09:00 UTC.

2022/06/18 - Saturday

The team met with Eric Loew on-line at 7 am local time to discuss the transmitter problems.

Eric and Jonathan had researched the problem in the NEXRAD manuals, and came up with some suggestions on how to check that the klystron is not failing. Also, we concluded that the arc fault detections are probably false alarms, as we had disconnected and reconnected the reverse-coupler crystal detector the previous day.

On-site this morning, we checked the reverse-coupler circuit that feeds into the arc detector. There was a loose connection there that we tightened.

We brought up the transmitter with the antenna stowed, to test its operation. No arcs have been detected so far, so it seems likely that the arc detections were in fact false.

We checked the filament and vacuum current and they are within spec. According to the counter the klystron has 34000 hours of operation on it, so about 3.9 years of continuous operation.

The power levels continue to jump between 2 semi-stable states about 2 dB apart. We have, we believe, isolated the pulse shaper as the most likely cause. We have asked the CWB radar group to check if they have a spare pulse shaper they can loan to us.

We brought up the system in scanning mode at 05:24 UTC. We set up the moments generation app (Iq2Dsr) to adjust the reflectivity for the measured power, to compensate for the power instability.

The radar ran OK, but the transmit power continued to drift throughout the remainder of the day. There was not much weather to see.

2022/06/19 - Sunday

The radar was shut down at 02:00 UTC for maintenance.

Using Sam's notes, Kina worked with the FieldFox and obtained good spectral plots of the transmit pulse. He found it is possible to save out configurations and recall them later. That should speed up these measurements in the future.

The extra filters are not currently installed, so the 2nd harmonic (at 5680 MHz) shows up 42 dB down relative to the primary at 2840.

We carried out routine maintenance on the pedestal. Kina found that the belts to the elevation motors were somewhat loose, so he tightened them. Some of the bolts on the elevation 2 motor were loose so those were also tightened.

In the lower section Kina put some more zip ties on the wire connected to the lightning conduction slip ring, to prevent rubbing.

Wen-Chau managed to secure the loan of a pulse shaper from CWB. Wen-Chau, Kina and Chris went to pick that up from the RCWF in the afternoon.

Cameron Chuss (a student from PSU) came out to the radar to run the scans in the afternoon.

The transmitter continued to run in impaired mode, with the top power cycling between 85.8 and 87.6 dBm.

2022/06/20 - Monday

Solar scanning commenced at 22:50 UTC on 2022/06/19, and ended at 23:54 UTC. This was a good time to get a baseline before we made changes to the system for the new pulse shaper.

Regular scanning recommenced at 00:00 UTC.

The radar was shut down for maintenance at 01:24 UTC, for the installation of the loaner pulse shaper.

Scanning was resumed at 09:12 UTC, with a new pulse width of 1.5 us. We worked on getting the pulse shape reasonable, and the power stable.

We will run overnight to monitor the power stability from the new pulse shaper.

2022/06/21 - Tuesday

For this morning the plan was to get the pulse shaper properly tested, the pulse configured and calibrations run.

We shut down to begin the maintenance at 01:48 UTC.

We used the procedures in the NEXRAD manuals to set the following:

- pulse width (1.4 us)
- the power of the drive to the klystron (33 dBm)
- the position of the pulse within the beam envelope
- the pulse rise time (150 ns)
- the transmitter power (88.4 dBm in fixed PRT mode, 88.28 dBm in staggered PRT mode)

In the end the pulse width on our scope is around 1.48 us. We decided to leave that alone and go with that pulse width, since our digital filters in the rvp8 and spoldrx are set for 1.5 us.

We ran engineering calibrations for the rvp8 and spoldrx digital receivers independently.

We started operating again at 04:24 UTC. The transmit power appears to be very stable, and the pulse shape looks good.

The rvp8 reflectivity appears to be slightly higher than the spoldrx reflectivity. That was true before the new pulse shaper, but to a lesser extent. We will investigate further.

At 09:12 UTC, implemented an RHI scan to sweep the path of GPM, which will come overhead around 10:16 UTC on a track that will be close to the 25/205 degree RHIs. The scan comprises 6 RHIs up to 90 degrees, at 22.1, 25.1, 28.1, 208.1, 205.1 and 202.1. The modified RHIs complete on time. This will be run until after the GPM overpass.

At 11:00 UTC scanning reverted to the default rhiUser scan strategy.

2022/06/22 - Wednesday

The radar was operated in PrecipIOP mode all day, and the transmit power and pulse shape remain stable.

A new set of bandpass filters arrived from the US, and Grant bench tested their response. These filters handle higher powers and have better suppression at 5.6 GHz than the filters previously acquired. This is the 2nd harmonic frequency where we may be exceeding allowed transmit levels. We hope to try them in the radar soon.

New arrivals Genny Faria and John Hubbert were also out all day today, on “day-pass” from quarantine. Dexter spent the day orienting Jenny on S-Pol and its operation.

2022/06/23 - Thursday

The radar was stopped at 01:36 UTC for maintenance.

We ran some tests and attempted to track down a number of issues:

- took spectra of the transmit pulse, with the new filter in place.
- tested the Mitch Switch after installation of chokes on the power supply wiring.
- tracked down noise in the Hc channel of spoldrx.
- reverted to the old firmware for spoldrx.
- ran new calibrations for the spoldrx and rvp8 receivers.
- checked the belt tension on the elevation motors in the top hat.

Operations recommenced at 04:36 UTC.

Deep convective storms developed over the high terrain to the south and east of S-Pol. This was a good case day.

2022/06/24 - Friday

Solar scanning was run early in the morning between 22:48 and 23:12 UTC, 2022/06/23 (around 7am local).

The radar was stopped at 01:36 UTC for maintenance.

We made some more transmit spectrum measurements for the document that Grant is preparing for the NCC. These will be compared to the NEXRAD plots with an emphasis on the second harmonic.

We also reinstalled the 1.5 us bitstream for the spoldrx, ran an engineering calibration and checked the noise floor. This now appears to be correct.

Operations recommenced at 03:16 UTC.

We stopped for one final calibration on the spoldrx at 04:00 UTC, with ops recommencing at 04:12 UTC.

During the afternoon there was good storm development both to the south and east. The radar performed well and appears stable.

2022/06/25 - Saturday

IOP 5 was declared for today, from 00:00 UTC (8 am local) to 18:00 UTC (2 am local).

No maintenance work was performed today. The radar operated uninterrupted.

There was active storm development through the morning and into the late afternoon. The radar worked well, without any known problems.

The spoldrx and rvp8 moments appear to match in their calibrations for reflectivity.

2022/06/26 - Sunday

No IOP declared for today. The forecast is similar to Saturday, with storm initiation over the high ground in the afternoon.

We stopped the radar for a pedestal inspection at 02:00 UTC (10 am local). The wind has been light and the azimuth motor temperatures were around 45C, so we wanted to check that things look OK.

No problems were found.

The waveguide was purged to lower the RH - it has been over 4%. During purging it dropped to around 2%, but went back up above 3% quite quickly.

The Vaisala weather station (WXT520) was oriented east instead of north, so the wind direction was incorrect by 90 degrees. This has been the case since the start of the project. We rotated the weather station to point north, i.e. a 90 degree rotation counterclockwise looking from above.

The radar was brought up again at 03:12 UTC. We started with the storm initiation RHI angle list.

The original forecast was for storms, but it appears that things have dried out and no significant storms are expected.

2022/06/27 - Monday

No IOP declared for today.

After discussions with the PI we went back to the 'unattended' schedule, with PrecipSur2 instead of PrecipRhi2. This is intended to put less wear and tear on the pedestal components.

Chaff was observed to the N of the radar, at a range of around 75 km, at 02:15 UTC.

Stopped antenna at 02:36 UTC to install fan in the pedestal, to try to keep the azimuth motors cooler. Restarted scan at 02:48 UTC.

Ran through the afternoon in PrecipRhiUser mode - Cameron controlling the radar.

At 09:24 UTC stopped normal scan to do solars. Ran in SIM mode from 09:24 to 09:40 UTC.

Then adjusted the azimuth setting by -0.08 deg to get azimuth in alignment with the sun.



Before adjustment.



After adjustment.

From 09:45 UTC to 10:05, ran in alternating mode. The SIM mode solars need to be rerun with different parameters, since the receiver is not switching.

After solars were completed, we started scanning again in staggered 2/3 mode at 10:12 UTC. The scan strategy for the evening is 'unattended'.

2022/06/28 - Tuesday

No IOP declared for today.

With high ambient temperatures and low wind speed we observed high temperatures in the pedestal.

Stopped antenna at 02:00 UTC to inspect the oil system and make sure the oil nozzles are spraying onto the gear correctly.

The oil nozzles were all found to be spraying correctly.

The belts were all inspected. The belt on azimuth 1 was somewhat loose, so it was tightened.

Operations restarted at 03:12 UTC.

2022/06/29 -Wednesday

No IOP declared for today.

No pedestal maintenance today. Operations ran throughout the day.

Storms started in the south and moved north up the mountain ridges. A major thunderstorm approached the radar and went overhead at around 09:30 UTC (17:30 local).

On non-radar items, we had a contractor come to the site and improve the road between S-Pol and the sea wall, so that the local trucks that clean up the coastline can pass the site.



2022/06/30 - Thursday

No IOP today. Weather was suppressed.

No pedestal maintenance today. Operations ran throughout the day.

The Cisco RV345 router (unit #1) hung up 3 times today. In the evening we upgraded the firmware on the router.

We had 3 students at the radar running the scans.

2022/07/01 - Friday

IOP 6 started today at 0 UTC - 8am local. It is due to run to 0 UTC on July 4.

Storms started building along the south central high ground by midday. There are 2 tropical cyclones in the vicinity, one to the south (Haikou) and one to the North-East (Aere).

The Cisco RV345 unit #1 has not hung since the firmware upgrade. We upgraded firmware on the spare RV345 router (unit #2) this morning.

The techs replaced the A/C unit in the annex. The installed unit was not cooling effectively. GOT will organize a repair of the old unit.

The removed unit will be repaired

We had 3 students at the radar running the scans.

2022/07/02 - Saturday

IOP6 continues through Monday.

In general a “under performing day”.

Storms did not develop as hoped.

It was hazy/cloudy in Hsinchu in the morning (7AM local) and very light rain fell around 9AM local.

Convection started at the north end of Taiwan but dissipated. Convection formed south of S-Pol along the coast extending to the mountains but was shallow in general.

Students switched individual angles in the adjustable RHI scan strategy but uncharacteristically, the antenna controller was interrupted aborting the PPI scans. Mike reset the antenna controller which solved the problem. The thought was to reset the antenna controller each morning in order to avoid the problem.

2022/07/03 - Sunday

IOP6 continues through Monday.

Made full_backup dirs of spol_cams images on USB drives mounted on pgen1 and pgen2. These are disk numbers RSF117 to 120.

Quiet day, no significant weather.

No radar problems.

Discovered the East and West cameras were pointing pretty far off their directional points so they were readjusted.

- East was pointing at 150 degrees and was corrected to 90 degrees from 0652-0706 UTC time.
- West was pointing at 298 degrees and was corrected to 270 degrees from 0723-0742 UTC time.

2022/07/04 - Monday

Stopped operations from 01:24UTC until 03:00 UTC for routine maintenance inspections of the pedestal. No issues were found.

Swapped USB drives on the MGEN and PGEN servers at 03:00 UTC.

Interesting thunderstorm weather in the mountains to the east and south.

The Cisco router hung this afternoon at around 09:11 UTC. A power-cycle got it running again. Looking through the logs there is nothing obvious as to the cause.

2022/07/05 - Tuesday

IOP7, 0730 JST 5 July - 1500 JST 5 July (TaHOPE only)

No IOP for S-Pol today. Forecast is for afternoon thunderstorms.

Stopped the radar at 02:12 UTC for maintenance. Grant Gray continues to troubleshoot the fast switch. A fuse continually blew so more fuses are needed.

Restarted at 02:48 UTC in unattended mode.

The Deputy of MOST (Ministry of Science and Technology) visited today in the afternoon along with several local news organizations.

Storms developed similar to yesterday but not as strong. Again it was very windy (coming from the west) at S-Pol. These winds apparently support the seen convection to the east and south of S-Pol.

0830 UTC rain begins at S-Pol with thunder and lightning.

2022/07/06 - Wednesday

No IOP today.

The weather was mainly afternoon thunderstorms.

By mid-morning (01:30 UTC) a line had formed in the Taiwan strait, moving eastward at 20 km/hr. This generated a gust front. This dissipated by 03:00 UTC.

2022/07/07 - Thursday

No IOP today.

The weather was mainly afternoon thunderstorms.

The students are cycling in and out between S-Pol and the Hsinchu weather station. So training activity is quite constant at S-Pol.

The replacement pulse shaper arrived from the reconditioning center.

Discovered the directional cameras were offline. The ethernet cable had become loose on the back of the network switch in the TX container. The cable was replaced. The total down time for the cameras spanned 07/06 at 0649 UTC to 07/07 0640 UTC.

2022/07/08 - Friday

No IOP today.

Sunny, hot, not much wind.

We stopped scanning at 03:12 UTC for maintenance.

We swapped in the replacement pulse shaper from the NEXRAD Reconditioning Center. It all looks good.

The loaner pulse shaper can now be returned to the CWB, with thanks!

Restarted ops at 04:36 UTC, scanning in Unattended Mode Schedule.

2022/07/09 - Saturday

No IOP today.

Sunny, hot, stable. No storms in the morning.

Maintenance carried out on the radar from 03:00 UTC to 03:48 UTC.

We tested the Mitch switch with a modification from Grant Gray. Unfortunately no success.

Restarted at 03:48 UTC in unattended mode.

2022/07/10 - Sunday

No IOP today.

Sunny, hot, stable. No storms in the morning.

Maintenance carried out on the radar from 02:24 UTC to 03:48 UTC.

- inspected the pedestal, checking belts, bolts etc.
- tuned the klystron cavity to improve the pulse shape with the new pulse shaper.

/scr/cirrus3/rsfdata/projects/precip/spolField

/scr/cirrus3/rsfdata/projects/precip/spolField

2022/07/11 - Monday

No IOP today.

Weather fine, wind at the site SW and 5 to 10 m/s.

No maintenance scheduled for today.

Forecast is for minor afternoon convection.

Possible IOP for tropical depression later in the week.

2022/07/12 - Tuesday

No IOP today.

We ran solar scans this morning, from 22:00 to 23:00 UTC. The transmitter was in simultaneous mode, fixed PRT of 0.001 s.

Between 03:00 UTC and 04:00 UTC, we ran surveillance scans in Simultaneous mode, fixed PRT of 0.001s, to gather time series data for clutter characterization. The scan angles were 0.0 to 4.0 in steps of 0.2 deg. The scan rate was 10 deg per sec. The wind was moderate, around 5 m/s, so the wind turbines were operating normally.

Normal scanning in unattended mode resumed at 04:00 UTC.

Note: there are some missing rays in the spoldrx data from around 06:00 to 09:30 UTC. This was caused by some analysis data processing running on mgen2 that overloaded the machine. So ideally we should reprocess this data in the QC step.

This was a very slow day with no significant echoes.

2022/07/13 - Wednesday

IOP8, 06:00 UTC 13 July - 06:00 UTC 16 July

Normal scanning in unattended mode.

This was a very slow day with no significant echoes.

Worked on the CWB network, attached the microwave link directly to pgen2, using the second ethernet port. Removed the cwb network from WAN1 on the Cisco. This is an attempt to make the router more reliable. We had been rebooting the Cisco router every morning at 3 am local (17:00 UTC). This has now been disabled.

Dealing with the network issues did cause some dropouts for cfradial data files on pgen1 and pgen2, for both the rvp8 (sband) and spoldrx files, between 07:00 and 09:00 UTC on 2022/07/13. This period should be rerun from the time series during the QC processing after the project.

Solar scans were run from 09:48 UTC to 10:27 UTC. These were run in simultaneous mode, fixed PRT 0.001s.

Clutter scans were run from 10:28 UTC to 10:50 UTC. The wind was light, less than 1 m/s. So many of the wind turbines were stationary, or moving slowly. This will be a good comparison case with 07/12. These scans were in simultaneous mode, fixed PRT 0.001 s.i

Normal scanning in Unattended mode was resumed at 11:00 UTC.

2022/07/14 - Thursday

IOP8, 06:00 UTC 13 July - 06:00 UTC 16 July
Convection suppressed due to high pressure.

2022/07/15 - Friday

IOP8, 06:00 UTC 13 July - 06:00 UTC 16 July
Convection suppressed due to high pressure.

There was a large visitor presence in the morning. Students from NCU were visiting the site along with Weiyu.

The noise level for both the spoldrx and rvp8 changed between 03:30 and 03:37 UTC, for the H and V channels. It seems possible that the attenuators on the Co-Pol channel were bumped during the visit.

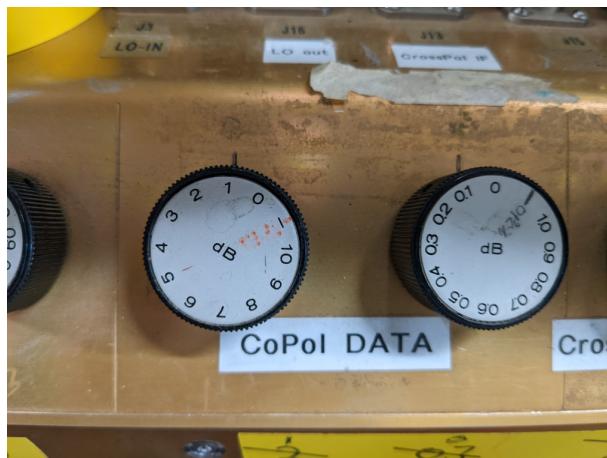
The Co-pol units attenuator had been set to:

- Co-pol units: 0
- Co-pol tenths: 1.0
- Cross-pol units: 3

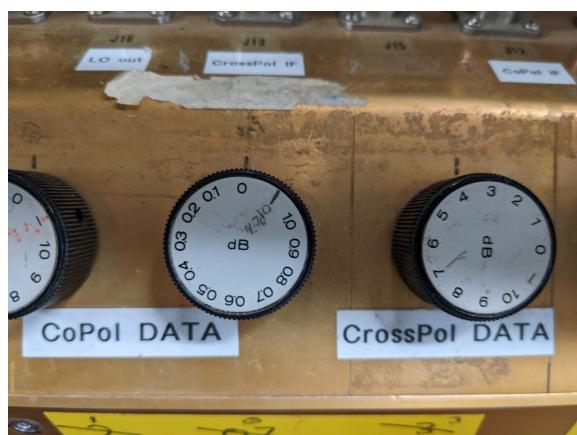
This appears to be benign - the co-pol attenuation should be 1.0. But it did change the noise characteristics in the H channel.

The attenuators were returned to the standard positions at 05:52 UTC:

- Co-pol units: 1
- Co-pol tenths: 0
- Cross-pol units: 3



Col pol attenuator - units



Co-pol attenuator - tenths



Cross-pol attenuator - units

2022/07/16 - Saturday

IOP8, 06:00 UTC 13 July - 06:00 UTC 16 July
Convection suppressed due to high pressure.

Stopped scanning at 01:36 UTC for calibration and maintenance.

From 01:36 to 02:00 UTC, ran 2 calibrations each for rvp8 and spoldrx. This is a good time to run cals because of the problems we had yesterday with the settings of the attenuator switches on the receiver box. The new calibrations will allow us to confirm the noise levels for both receiver channels.

The calibrations were run with the antenna pointing to 315 deg az, 45 deg elevation, to point away from the sun.

We checked the pedestal starting at 02:00 UTC - motors, belts etc. All seems good.

From 02:43 to 02:58 UTC ran clutter scanning in staggered 2/3 mode. This is a good high-wind case for the wind farms, with the wind speeds around 10 to 12 m/s.

From 03:06 to 03:30 UTC ran clutter scanning in simultaneous mode.

At 03:36 UTC restarted normal scanning in Unattended mode.

Anomalous DBZ values noted at 2022/07/16 06:27 UTC, SUR elevation 2 deg. Looks like bad calibration data was applied. Occurred for both spoldrx and rvp8 data. Will need to be fixed in QC.

Changes to the noise characteristics in the H channel occurred again this afternoon, between 06:25 and 06:37 UTC. So it seems likely we have some instability in the H receiver channel, and that the attenuator settings (that we noted yesterday) were probably not the cause. This will need to be investigated.

We found loose connections on the cables between the LNAs and the receiver box. These were tightened up.

We stopped scanning at 09:10 UTC to perform calibrations, after the cables were tightened.

Restarted scanning at 09:24 UTC after the calibrations were complete.

2022/07/17 - Sunday

No IOP today.
Convection suppressed due to high pressure.

Strong winds at the S-Pol site, averaging around 10 m/s for much of the day.

The waves were breaking over the pylons. Wind turbines spinning.

2022/07/18 - Monday

No IOP today.

Convection suppressed due to high pressure.

The radar was stopped for calibrations between 01:24 and 02:24 UTC.

Quite windy today. Large waves. Considerable spray.

John pointed out that there is good sea clutter in the S-Pol moments yesterday and today.

Some afternoon thunderstorms, but not strong.

2022/07/19 - Tuesday

No IOP today.

Convection suppressed due to high pressure.

Some nice afternoon thunderstorms over the high terrain near Taipei.

No radar problems noted.

2022/07/20 - Wednesday

No IOP today.

Hot and relatively dry today. Convection suppressed due to subtropical high pressure.

Azimuth motor temperatures were noted to be quite hot - towards 50C.

Azimuth 2 motor running hotter than azimuth 1.

And the oil pressure correspondingly low around 37 PSI.

Stopped the antenna at 02:24 UTC for a pedestal inspection.

The box fan in the pedestal was not on - that was rectified.

No other problems were found.

Scanning was restarted at 02:48 UTC.

Nice storm over the mountains late afternoon.

2022/07/21 - Thursday

No IOP today.

Hot and relatively dry today. Convection suppressed due to subtropical high pressure.

We have a problem with the test pulse, so we are performing some diagnostics.

Scanning stopped for maintenance from 05:36 UTC to 05:48 UTC.

Scanning stopped again for maintenance from 06:00 UTC to 06:24 UTC.

The test pulse switching appears to have problems.

Bad H channel power values between 05:55 and 06:20 UTC.

2022/07/22 - Friday

No IOP today.

Hot and relatively dry today. Convection suppressed due to subtropical high pressure.

We were unable to find the cause of the problem with the test pulse.

John left this morning.

2022/07/23 - Saturday

No IOP today.

Hot and relatively dry today. Convection suppressed due to subtropical high pressure.

Kina left this morning.

Scanning was stopped for maintenance and calibrations between 03:00 and 04:24 UTC.

2022/07/24 - Sunday

No IOP today.

Hot and relatively dry today. Convection suppressed due to subtropical high pressure.

2022/07/25 - Monday

No IOP today.

Stopped normal scanning at 22:24 UTC.

Started solar scans at 22:24 UTC. (SIM tx mode)

Stopped solar scans at 22:55 UTC.

Restarted unattended scanning at 23:00 UTC. Tx Staggered 2/3 as normal.

Starting clutter scans at 02:00 UTC. SIM mode, PRF 1000.

Clutter scans from 02:00 to 02:30 are 10 deg/s, elev angles 0.0 to 4.0 deg in 0.2 deg steps.

At 02:30 started clutter scans at varying antenna rates: 10, 8, 6, 4, 2, 1 deg/s. Elev angles 0.5, 1.0, 2.0, 3.0, 4.0.

Restarted normal scanning at 03:24 UTC.

Just a few small storms in the afternoon.

A fire started towards Taoyuan around 08:20 UTC. No sign of the smoke on the radar.

2022/07/26 - Tuesday

No IOP today.

Hot and relatively dry today.

Convection suppressed due to subtropical high pressure.

2022/07/27 - Wednesday

No IOP today.

Hot and relatively dry today.

Convection suppressed due to subtropical high pressure.

Interesting cloud-line feature off-shore about 60 km range to the west.

Shows up on satellite.

Weak SNR - about +15 dB.

Negative ZDR - perhaps side-lobe?

Disconnected the test pulse cable at 03:12 UTC, since the test pulse in staggered mode is not working correctly.

2022/07/28 - Thursday

No IOP today.

Hot and relatively dry today.

Some moisture is starting to move in.

But still relatively dry.

Some small storms observed on the high ground.

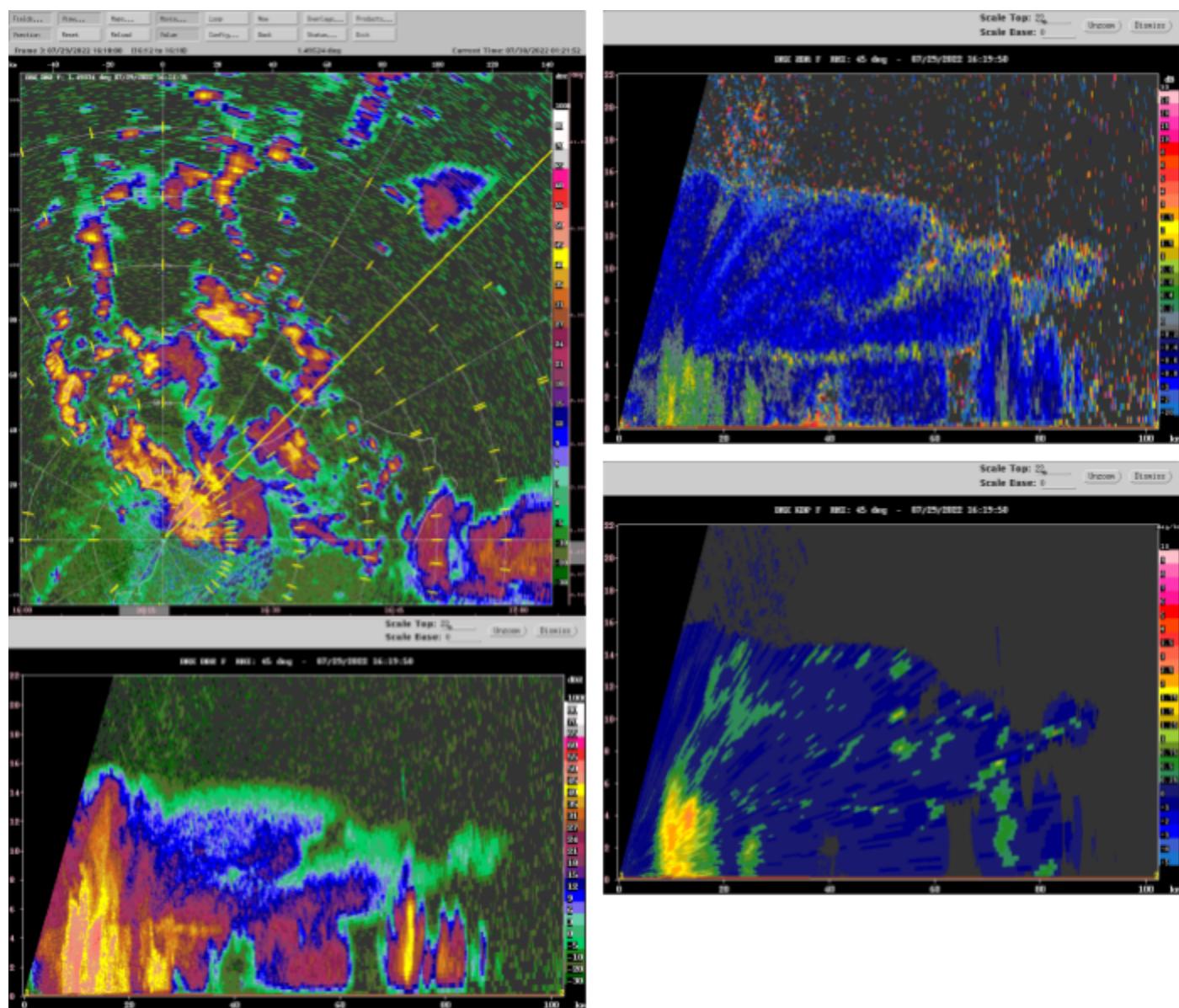
Calm wind, wind turbine clutter handled by the clutter filter.

2022/07/29 - Friday

IOP9: 00:00 UTC 29 July - 15:00 UTC 29 July

Relatively quiet day with some echoes.

Then nice storms overnight - these just after midnight local.



2022/07/30 - Saturday

No IOP today.

There were storms overnight, with activity continuing into the morning.

A pedestal maintenance inspection was performed to prepare for the upcoming IOP.

This was expedited to avoid missing scans, given the current storm activity.

The scanning was stopped between 03:00 and 03:12 UTC.

The PrecipIOP schedule resumed at 03:12 UTC.

Scanning was stopped from 13:50 to 14:50 UTC, due to operator error.

2022/07/31 - Sunday

No IOP today.

2022/08/01 - Monday

IOP10 is in effect.

IOP10 should run from 2022/08/01 00:00 UTC to 2022/08/04 00:00 UTC.

There is moisture advecting in from the east.

2022/08/02 - Tuesday

IOP10 is in effect.

IOP10 should run from 2022/08/01 00:00 UTC to 2022/08/04 00:00 UTC.

Heavy rain event.

Bad spectra showing up on spoldrx around 07:12 UTC. The spoldrx was losing lock on the Spectracom GPS. The spoldrx reflectivity showed that the clutter filter was not working correctly, and the velocities on spoldrx were bad. The rvp8 moments look OK.

We stopped the radar at 07:48 to investigate.

The problem turned out to be a bad coax cable from the GPS antenna to the plug on the side of the transmitter container. We fixed this by running a coax from the GPS antenna directly to the Spectracom, through the port at the antenna end of the container.

We restarted spoldrx, and the radar was brought up and operational again at 09:24 UTC.

2022/08/03 - Wednesday

IOP10 is in effect.

IOP10 should run from 2022/08/01 00:00 UTC to 2022/08/04 00:00 UTC.

A contactor in the transmitter end-unit AC (Bard) failed overnight. The transmitter container started to warm up, and the Klystron temperature reached above 40C.

The transmitter and scanning were shut down at 2022/08/03 00:00 UTC.

The AC unit was repaired with a spare contactor.

The pedestal was inspected for belts, oil leaks etc. Some minor oil leaks were found on the transmissions, but nothing serious or unexpected.

2 calibrations were run for each of the rvp8 and spoldrx digital receivers.

The radar was brought up and operational again at 2022/08/03 02:24 UTC.

There was a small group of storms that moved over the radar from the SW, getting to the radar around 15:00 UTC. This is a good case for checking the ZDR calibration. ZDR appears to be biased by around -0.4 dB.
20220807/20220807_122747.772_030_358.sur_trans.sim.dbm_phase.iwrf_ts
20220807/20220807_122749.684_040_018.sur_sim.dbm_phase.iwrf_ts
20220807/20220807_122824.593_040_024.sur_trans.sim.dbm_phase.iwrf_ts

2022/08/04 - Thursday

IOP11 is in effect.

IOP11 should run from 2022/08/04 00:00 UTC to 2022/08/05 00:00 UTC.

The target is afternoon thunderstorms.

Nice chaff echoes in the Taiwan Strait - China is playing games.

2022/08/05 - Friday

No IOP in effect.

Radar down for quick maintenance from 02:00 to 02:12 UTC.

The transmitter warning strobe was replaced.

The target today is afternoon thunderstorms.

Big group visit from CWB.

GPM overpass at around 07:30 UTC. Special RHIs for that.

Unfortunately not many storms.

2022/08/06 - Saturday

No IOP in effect.

Dry. Not many thunderstorms are expected.

Chaff cloud visible over the coast of China, 01:30 UTC.

Noted high temperatures on the azimuth motors at 02:00 UTC.

Stopped the radar for pedestal inspection at 02:12 UTC. No particular problems found.

Installed extra fan in pedestal section with oil pump.

Restarted scanning at 02:48:00 UTC.

Some nice storms 180 km to the south this afternoon.

2022/08/07 - Sunday

No IOP in effect.

Dry. Not many thunderstorms are expected.

At 00:30 UTC the H channel gain changed by about 1 dB. This caused a serious ZDR bias in the data from this time until around 08:00 UTC on 08/08. We only discovered this the next day.

During the day the operators had problems with the insertion of IDLE commands into the GUI sequence, which stops the scanning. This occurred several times.

At around 13:10 UTC this occurred again. We stopped the scan, restarted the GUI backend on control1 (restart_GuiMan.ops) and restarted scanning. There were no further problems.

Some nice storms in the afternoon and into the evening.

2022/08/08 - Monday

No IOP in effect.

The technicians noticed a light on the transmitter, indicating an arc fault had occurred at some point. The transmitter was still running.

Also, they noticed that the waveguide humidity had risen to over 6%.

We stopped the scan from 02:00 UTC 02:06 UTC to crack open the waveguide valves and purge the system. We left them open and we will close them later in the day. We are monitoring the compressor to ensure it does not run too often.

We noticed that the data was not being archived correctly to the disks on mgen2. On investigation it was found that this was caused by python being found in anaconda3 instead of /usr/bin. At 02:45 UTC we reverted to python in /usr/bin and started rsyncing the missing data across to the USB drives.

We have noticed oddness in the ZDR values recently. Unfortunately we do not have the test pulse.

Fortunately we had rain over the radar this afternoon. We ran vertical pointing from 08:36 UTC to 08:54 UTC. The computed ZDR bias from the vert pointing was -1.3 dB for the rvp8 and -1.5 dB for the spoldrx. These values were entered for lq2Dsr on mgen1 and mgen2 at 08:54 UTC. The subsequent ZDR values look much better.

2022/08/09 - Tuesday

No IOP in effect.

Started solar scans at 22:34 UTC. These failed - the control program got stuck on sweep 1 and did not move on. I restarted GuiMan and AntMan, no luck.

Gave up and restarted unattended mode at 23:00 UTC.

Stopped at 01:36 UTC for calibrations.

Started scanning at 02:00 UTC after completing calibrations.

Today the fiber connection and the Cisco routers became quite unstable, with many gaps in the network connection.

This was tracked down to a possible bad cable between the fiber modem and the Cisco. The cable was replaced and the network was stable from about 12:00 UTC onwards.

2022/08/10 - Wednesday - last operational day!!

No IOP in effect.

Tried solar scans again at 22:25 UTC. These failed again. Will try at the site.
Reverted to IOP mode with 360 deg RHIs.

At 01:36 stopped scanning, to do solars.

Solars did not work properly. It got stuck on the first tilt.
Rebooted control1 - did not help.
Rebooted pmac - success.
The solars then worked.

Solars were performed as follows:

Around 01:48 to 01:50: SIM mode triggers, tx off.
Antenna pointing looks good.

Power differential between co and cross pols channels.

Starting 01:56 UTC, staggered mode, tx on.

H power at center: -61.7 dBm

V power at center: -60.25 dBm

02:16 UTC - 4 solars completed, staggered mode, tx on.

Antenna pointing looks good.

Starting 02:16 UTC, SIM mode, tx on.

Stop sim solars, 02:26 UTC.

Completed 2 SIM solars, tx on.

Then performed 2 calibrations for each of rvp8 and spoldrx.

Restarted normal scanning at 03:00 UTC.

Waveguide RH noted high at 6.6%.

Stopped scanning at 05:44 UTC to work on waveguide pressurization.

Cracked open the purge valves.

RH dropped to 4.5%.

Restarted scanning at 05:48 UTC.

Stopped scanning at 09:36 UTC.

Started solars at 09:36 UTC in staggered 2/3 mode with Tx on..

Ran 3 solars in staggered 2/3 mode, completing at 09:50 UTC with Tx on.

Changed to SIM mode, with Tx on.

Started solars in SIM mode with Tx on at 09:52 UTC.

Ran 2 solar scans in SIM mode with Tx on.

Restarted normal scanning at 10:04 UTC.

2022/08/11 - Thursday - end of operations

Heavy rain on the way to the radar!!

mgen2 had a network problem starting around 18:00 UTC on 2022/08/10. Since that reads the spoldrx time series data, we do not have spoldrx data from the last 6 hours of the project.

However, the rvp8 data stream was up and running fine.

We unplugged the mgen2 cable to the switch and plugged it back in, and the network came back up fine. That is the first time that failure has occurred on the project.

00:10 UTC - starting solars in staggered 2/3 mode. 3 scans completed.

00:30 UTC - starting solars in SIM mode. 2 scans completed.

00:40 UTC - starting clutter scan in SIM mode.

01:00 UTC - ending clutter scans.

Starting calibrations in staggered mode.
Calibrations complete 01:30 UTC.

Shutting down transmitter: 01:45 UTC.
Depressurizing waveguide.

Checked rsync to backup drives, removed drives: 02:00 UTC.

