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To	**Amateur Radio Digital Communications, Grants Department**
From	The Deep Space Exploration Society (DSES), EIN 84-1178383, 4164 Austin Bluffs Pkwy, Suite 562, Colorado Springs, CO 80918
Grant	Agreement 2068, "DSES-EVE-26_Proposal", $21,200; grant period extended by ARDC on 16 October 2026
Subject	Interim report on the October 2026 Earth-Venus-Earth experiment, promised in our notice of 16 October 2026
Signed by	Richard M. Hambly, K0GD, Project Manager and the Society's primary contact under Section 14

Summary

Our notice of 16 October promised ARDC a report on the October experiment, with the datasets and the decode result, by 30 November. This is that report. The result is plain: the Society did not detect an echo from Venus, and no message was decoded.

The station transmitted toward Venus at 23 cm (1299.5 MHz) on the days around the inferior conjunction of 24 October, but two faults in the 23 cm feed package, both present before the first transmission toward Venus, meant that it could not have succeeded. The low-noise amplifier (LNA) had failed during high-power testing, so the station never had a working receiver on the sky. The power amplifier could not shed its heat and was limited to approximately 500 to 600 W, less than its conservative 1,500 W rating, as each module was rated at 1,200 W. Before the receiver's LNA could be replaced, the brake solenoid on the dish's azimuth drive failed on 26 October and the dish could no longer be steered safely, which ended the experiment. Follow-up work on the dish in November then found a pointing error and a wiring fault that are being corrected along with the brake.

The parts of the station built new for this experiment worked: the DSES EVE Modem, the control station, the GPS-disciplined reference, the sequencer and the session archive. The causes of the failures are understood, the fixes are in hand or in work, and no grant funds were spent on the October experiment beyond $223 of repair parts. The Society is rebuilding both the 13 cm and the 23 cm systems for the June 2028 conjunction, with Earth-Moon-Earth operation as the proving ground in between. We thank ARDC for granting the extension on the day we asked for it.

1. Where the notice left off

The notice of 16 October reported that the 13 cm (2.4 GHz) system the grant funded would not be ready for the 2026 conjunction, and that the experiment would be made at 23 cm with the equipment from the Society's 2025 experiment, upgraded with a new low-noise amplifier, new driver amplifiers, a GPS-

disciplined reference, and a modem written by DSES on the Open Research Institute's Venus waveform. ARDC replied the same day that the time extension was granted and that the new timeline would appear in the Society's ARDC account.

The notice also said what was still open on that date: the output of the 23 cm power amplifier had not been confirmed, and the amplifier's power and thermal behavior over a full four-minute transmission, and an Earth-Moon-Earth (EME) rehearsal of the complete chain, were to come before the experiment. Those two open items are where the experiment was lost, and this report sets out how.

2. What happened, 16 October to 8 November

The record below is drawn from the project team's correspondence, the modem's session archive and the Society's site reports.

Date	Event
19 October	Second integration test at Haswell. A higher-power driver amplifier in the control room replaces the 5 W driver and makes up the feedline loss. The 23 cm power amplifier is run at power for the first time since its repair and overheats well below its rating. The 23 cm feed, with its low-noise amplifier, is mounted on the dish
20 October	The operating plan is reworked for reduced power, on an assumption of about 600 W: seven message passes a day instead of five, about eight hours, using every hour Venus is above 10 degrees elevation. A dish pointing calibration planned for 21 October is given up because the feed package is not yet installed
22 October	The power amplifier package is lifted into the hub of the dish and installed. EME tests that day return no echo
23 October	First Venus sessions. The morning's runs are lost to two software problems on the station computer, a transmit-stream underrun and a keying selection that did not survive a restart; both are fixed and released that morning. A clean session follows from 17:31 to 22:30 UTC: 35 four-minute transmissions, nearly five complete message passes, with the reference locked and no gaps in the recording. No decode
24 October	Conjunction day. Analysis of the archived recordings shows that the receiver's noise floor equals that of the software radio with nothing connected: the receive chain from the feed is delivering nothing. The sequencer wiring is verified from photographs and documented in a memo. No climber is on site, so the feed cannot be reached. Sessions continue in order to exercise the system and collect data
26 October	A climber reaches the feed. The low-noise amplifier is removed and tested on the bench: its protection relay operates, but no signal passes from input to output. The same afternoon the azimuth drive stops with the dish 11 degrees behind its commanded position: the brake has not released. The brake is released by hand, the dish is stowed, and the azimuth drive is disabled. The experiment is placed on hold
27 to 29 October	The cause of the LNA failure is identified and a replacement with external protection is built on the bench. A return to the site is planned for 30 October
28 October	The Society's President ends the experiment on safety grounds. Until the solenoid is replaced the brake must be released and applied by hand at the top of the pedestal at the start and end of every operating day, one qualified climber is available and not every day, and the dish's pointing is by then in doubt. The members are told on 29 October
3 November	The Board calls for a debrief of the experiment and for this report
8 November	A work party removes the EVE package and the 23 cm feed, installs the 1420 MHz feed, and recalibrates the pointing. Azimuth is found to be 1.5 to 2 degrees off. The control cable to the hub is found shorted



Figure 1. The 23 cm feed at the hub of the 60-foot dish on 22 October 2026, with the low-noise amplifier mounted on the receive port and the receive coax leaving to the control room. The transmit port and the power amplifier package are behind the frame at right.

3. What failed, and why

The low-noise amplifier. The amplifier built for this experiment has a transmit-receive relay inside its housing. In transmit, the relay switched the antenna path through a short coax and an SMA connector to an external 50 ohm load rated at 5 W, and it left the input of the sensitive amplifier stages unterminated. Both choices are wrong for a feed that carries a kilowatt. The receive port of this feed couples on the order of 15 W when the transmitter runs at 1.2 kW, a figure measured in 2024, so at full power the load and its connector would be asked to absorb about three times their rating, while the amplifier stages sat open next to that power with nothing to hold their input at 50 ohms. The amplifier failed at once under high-power transmission, during testing on the ground, before the feed went up on the dish. The correct arrangement keeps the relay outside the amplifier housing, puts a 50 ohm load on the amplifier's input during transmit, and leaves the antenna port open or shorted. A replacement built that way was ready on 29 October, too late to be installed, and has yet to be proven at power.

The power amplifier. The 23 cm transmitter combines two solid-state amplifier modules rated at 1,200 W each. The package as built does not provide the heat removal the modules' manufacturer specifies, and the modules tripped their internal over-temperature switches at a fraction of their rated output. One module was better cooled than the other, but no combination, either module alone or the two together, would hold more than approximately 500 to 600 W through a four-minute transmission. The protection worked as designed and the modules are undamaged. The package had been built for the 2025 experiment's cycle of one minute

on and one minute off; the Venus waveform needs four minutes of continuous carrier in every five, and that requirement was not tested at power until 19 October, three days before the first operating day. At that power the link is 3 to 5 dB below the power the link budget was written around, which the longer operating days could only partly recover.

The azimuth brake. The dish's azimuth axis has a spring-applied brake released by a solenoid, original equipment about sixty years old. On 26 October the solenoid burned out and the brake stayed on. The drive controller detected a motor that would not turn, faulted, and protected the motor and the drive train, so nothing else was damaged. But the fault was not reported to the control room, and the station tracked for about 45 minutes with the dish standing still before anyone noticed. The dish can be moved with the brake released by hand, and it was, to stow it; that is not a basis for a week of operation by volunteers.

What the follow-up found. When the pointing was recalibrated on 8 November the azimuth was 1.5 to 2 degrees off. The crew had noticed a shift of about that size in the dish's maintenance position when the package was installed on 22 October, so the error was very probably present throughout the experiment. The dish's beam at 23 cm is under one degree wide. The two azimuth encoders agree with each other, which points to the mechanical drive between the axis and the encoders and not to the electronics; the recalibration corrects the error but does not yet explain it. The same visit found all eight conductors of the control cable between the pedestal and the hub shorted together, which is the cable that carries power and keying to whatever is mounted at the feed.

We set these out without softening them because any one of the first two faults, and very probably the pointing error as well, would have prevented a detection by itself. The experiment did not come close, and the reasons are engineering errors in hardware the Society built and maintains, not the link budget, the waveform or the method.

4. What worked

The DSES EVE Modem scheduled each session from the JPL ephemeris, applied the two-way Doppler correction, keyed the amplifier and the low-noise amplifier through the sequencer with its guard times, generated the Open Research Institute "Spiral #2" waveform on the GPS-disciplined reference, recorded the received signal, and wrote a session report, unattended for eight hours at a time and operated remotely from Colorado Springs over the Society's network. Fifteen releases, 1.0.10 through 1.0.24, were cut between 20 and 23 October as the station computer and the first days on the air exposed problems, each fixed and published the same day through the modem's self-update channel. The control-station shelf, the higher-power driver amplifier and the measured feedline (8.8 dB one way) delivered the specified drive to the feed. New 120 V and 240 V outlets were installed at the hub.

The archive is what found the fault. On 24 October, with no climber on site, the recordings themselves showed that the receiver's noise floor was that of a bare radio, which located the failure in the receive chain two days before anyone could reach the feed, and pointed away from the software and the schedule. A noise-floor check of that kind, with the low-noise amplifier switched on and off, takes a minute from the control room and will be made before every session from now on.

The method was also proven this conjunction, by others. On 17 October the Dwingeloo radio telescope transmitted to Venus on 1299.5 MHz, the reflections were received at Stockert, Effelsberg, Westerbork, the Lovell telescope and e-MERLIN, and the message "VENUS ECHO" was decoded, using a frequency-shift-keyed waveform with error-correcting coding from the same CAMRAS and Open Research Institute collaboration whose waveform our modem implements. We congratulate them. Their result confirms the link analysis that our own plan rests on.

5. The result and the datasets

No echo was detected and no message was decoded. Because the receive chain was dead from the first transmission, no echo can be present in any recording, and no amount of post-processing will recover one. A known-signal search of sample recordings from 23 and 24 October, made before the cause was understood, is consistent with noise.

The modem archived the raw received signal and a session report for every session from 22 to 26 October. As science data the recordings contain receiver noise only, and we do not propose to publish them as a Venus dataset. They are kept, and they and the session reports are available to ARDC or to anyone who asks. Their value is as an engineering record: they document the transmit schedule, the Doppler model, the keying and the reference lock of a working station, and they are the evidence for the receive-chain diagnosis in part 4. The software, its design document and its operator's guide remain public under GPL-3.0, with the ARDC acknowledgment, as described in the notice.

6. What is being done

The dish. A replacement for the brake solenoid is being sourced from the brake's manufacturer, and a ground-level manual release has been planned for the interim. The control cable to the hub will be replaced with a properly rated cable. The team is designing a way for the pedestal drive to report its faults to the control room, and a member is donating new drive controllers, one of them as a spare and development unit. The cause of the azimuth error is being investigated in the drive between the axis and the encoders, and the pointing will be checked again after the dish has been run, to see whether the error returns. A lubrication and inspection schedule for the bearings, the ring gear, the drive chains and the elevation jackscrews is being drawn up. None of this work is charged to the grant; it is the Society's own maintenance, and it serves every use of the dish.

The 23 cm system. The power amplifier package will be rebuilt with cooling that meets the module manufacturer's requirements and with the power supplies moved out of the feed to reduce its size and weight. The receive protection will be external to the low-noise amplifier, as described in part 3. The rebuilt package will be run at full power for the full transmission time into a dummy load on the ground, and then proven on the Moon, before it is used for anything else.

The 13 cm system. Responsibility for the 13 cm feed, power amplifier package and low-noise amplifier has passed to a new qualified volunteer, who holds the hardware and is assembling the eight amplifier modules into a testable package, building the 13 cm feed and its mount in the hub, and planning to characterize the dish at 13 cm. The project manager has taken the control and metering electronics. Two modules are going to the engineer who proposed phasing the modules dynamically, for the bench test described in the notice. The lessons of part 3, on cooling and on receive protection, are design requirements for this package from the start.

The path to June 2028. Both systems are to be rebuilt and ready well before the next inferior conjunction, on 1 June 2028. EME operation with each rebuilt system through 2027 is the proving ground: the Moon returns an echo in two and a half seconds at modest power, so every part of the chain, including pointing, can be tested end to end many times before Venus is in range again.

7. Funds

No grant funds were spent on the October experiment beyond repair parts. The Treasurer's project report for October shows $223.12 of expenses categorized to the EVE project, both for the repair of the 23 cm amplifier's protection electronics (a current and voltage protection board, $194.92, and a transistor, $28.20). The purchase of the control-station equipment described in part 7 of the notice has not been made and is deferred until the rebuild plan is settled.

ARDC granted the extension the day the notice was sent, and on the strength of that reply and of what we have heard from ARDC since, the Society is proceeding on the basis the notice set out: the 23 cm experiment was the Phase 2 attempt under this grant, and the 13 cm hardware and the unspent funds of both grants, EVE-25 and EVE-26, carry into the 2028 effort. The written plan with milestones and a cost estimate that the notice promised before the end of 2026 will now cover both bands. The remaining funds will go, on the project team's best judgment, to rebuilding the two systems for the 2028 effort: the cooling and receive protection of the 23 cm package, the 13 cm package and its feed, and the control-station equipment.

8. Deliverables against the proposal

Proposal deliverable	Status, 13 November 2026	Note
2.4 GHz (13 cm) system, 1,500 W	Not delivered in 2026	Hardware on hand; being rebuilt for June 2028 (part 6)
Feed and receive-chain optimization	Not achieved	The 23 cm low-noise amplifier failed; receive protection redesigned (part 3)
Validation by modeling, subsystem tests, end-to-end rehearsal	Partly done	Modem validated on the bench and on the station computer; the EME rehearsal returned no echo
October 2026 experiment	Made; no detection	Sessions 22 to 26 October at 23 cm; ended by the brake failure
Open-source models, DSP methods, system designs	Done and continuing	DSES EVE Modem 1.0.24, Design Description and ICD, Operator's Guide, GPL-3.0, with the ARDC acknowledgment
Public datasets	No science data	Recordings are receiver noise only; kept and available on request (part 5)
Two or three presentations or papers	One so far	The 28 September DSES Science meeting talk; this report goes to the Society's Board as its debrief of the experiment
STEM and community engagement	Continuing	Member volunteers staffed the site through the experiment, one driving from Chicago; the October school visit and open house reported in the notice

9. What we learned

First, receive protection is part of the transmitter. An amplifier that must survive next to a kilowatt has to be protected by design, with the protection rated for the power it will actually see, and proven at power on the bench before it is trusted on the dish.

Second, a thermal design has to be checked against the manufacturer's data and then tested at the real duty cycle, weeks ahead. Our full-power test came three days before the window. It found the problem, and by then nothing could be done but lower the power.

Third, a failed rehearsal is a result. The notice said that an EME rehearsal of the complete chain was the gate for the experiment. The rehearsal on 22 October returned no echo, and with the best days of the window passing we went on to Venus while the diagnosis continued. The Moon was telling us on the first evening what took four more days to confirm. The project manager set that gate and did not hold it.

Fourth, the dish is part of the system. The pointing calibration was displaced by the installation it was meant to precede, and a sixty-year-old brake solenoid had no spare and no alarm. Pointing calibration and a mechanical check of the dish are now steps that come before an experiment, not after it.

Fifth, electronics at the feed need a climber for every fault. What can live on the ground should, and what must be at the feed has to be diagnosable from the control room, as the receiver fault turned out to be.

Last, the integration began about two weeks before the window. The 2028 schedule puts both systems on the Moon well ahead of the window.

10. Next reports

The written plan for both bands, with milestones and a cost estimate, goes to the DSES Board before the end of 2026, with a copy to ARDC. The twelve-month report under Section 4 follows by 28 May 2027. ARDC's grants staff are welcome to call me at any time. The Society is grateful for ARDC's support and for its patience with a result that is not the one any of us wanted to report.

Richard M. Hambly, K0GD, EVE-26 Project Manager, for The Deep Space Exploration Society

Supported by a grant from Amateur Radio Digital Communications.

Appendix A. Public materials

The DSES EVE Modem, source, releases and documents: github.com/dses-science/eve-modem (GPL-3.0); installers and the self-updating release channel: gpstime.com/sw_distribution/eve-modem. The Society's notice and interim report of 16 October 2026, on file with ARDC. The 2026 Dwingeloo Earth-Venus-Earth result: camras.nl/en/blog/2026/earth-venus-earth-2026. ORI's EVE waveform and link-budget work: github.com/OpenResearchInstitute/EVE. The Society's website: dses.science.