
2026 Filter Design Challenge Description and Conditions

Author: Robert Fennis

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Email: info@emerge-software.com

2026 EMerge Filter Design Competition

Thanks for showing interest in the first 2026 EMerge software design challenge! This document describes the goal of the challenge, the design constraints, the winning criteria, and the terms of participation.

The outcome of the competition will be determined by both the performance of the filter and the creativity of the design. Because defining “the best” filter is not as simple as optimizing a single metric, the jury will consider a combination of design quality, creativity, compactness, ingenuity, and novelty.

A single winner in the competition will receive a LiteVNA64 vector network analyser with two SMA cables, a TRL calibration kit corresponding to the filter design, and a PCB containing the winning filter layout.

An honorary title will also be awarded to the most creative design and filter with the best raw performance. **No tangible price is associated with these awards.**

- Sign-up deadline: January 31st, 2026

- Sign up via

<https://forms.gle/UfwijW3S8qtiwiN9>

- Submission deadline: June 1st, 2026
- If fewer than 10 participants sign up, the competition may be cancelled or postponed.
- The winner will be announced on August 1st, 2026.
- The prize will be shipped on or before October 1st, 2026.

Please read the rules carefully before participating.

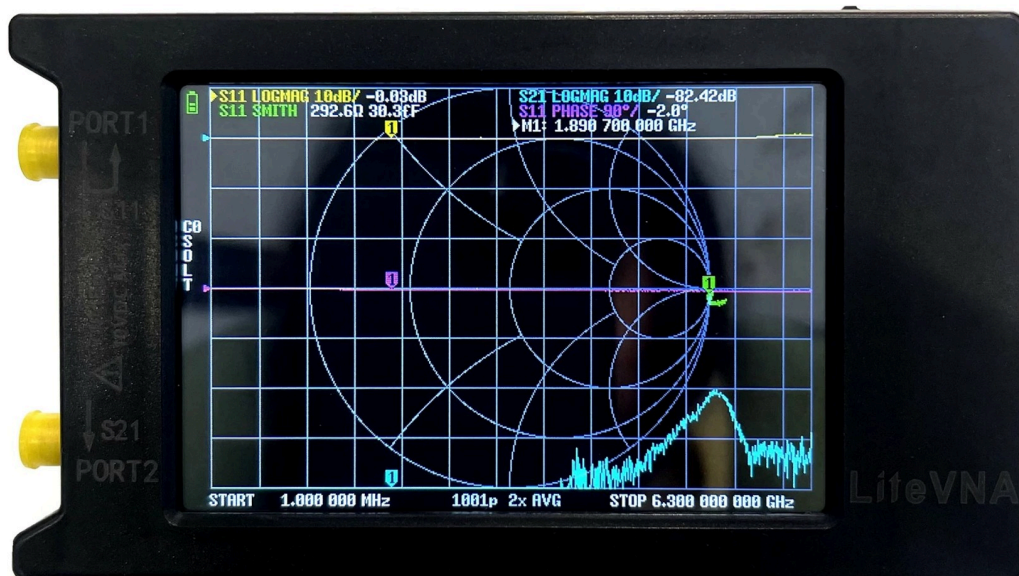


Figure 1: The LiteVNA 64 with a range of 50 kHz to 6.3 GHz.

Competition rules

1. Competition Conditions

- 1.1 The competition may be cancelled or postponed if fewer than 10 participants sign up before the registration deadline.
- 1.2 Deadlines may be extended if an insufficient number of submissions are received by the original submission date.
- 1.3 This competition is a skill-based technical challenge.
 - 1.3.1 Winners are selected based on the quality, performance, and creativity of the submitted designs, as judged by experts.
 - 1.3.2 No entry fee is required and no winners are chosen at random.
- 1.4 The competition is not a lottery, raffle, or any other form of gambling.
- 1.5 These rules describe the intended format, conditions, and prizes for the 2026 EMerge software design challenge, but are considered **preliminary** until the sign-up deadline.
- 1.6 The organizer may adjust or clarify the rules (including technical specifications, filter requirements, and judging details) up to the sign-up deadline of January 31st, 2026.
 - 1.6.1 After January 31st, 2026, only clarifications or non-material corrections (for example fixing typos or resolving contradictions) will be made, unless legal, safety, or logistical issues require more substantial changes.
- 1.7 The current planned timeline of the competition is:
 - Sign-up deadline: January 31st, 2026
 - Submission deadline: June 1st, 2026
 - Winner announcement: August 1st, 2026
 - Prize shipment (latest): October 1st, 2026
- 1.8 Any changes to these dates will be:
 - Announced on the main competition page,
 - Communicated by email to the provided address,
 - Reflected in an updated version of this rules document, with the date of the change indicated.

2. What you can win

This challenge will determine a winner in three categories. Only the first category can win a physical prize.

- 2.1 **First prize – overall best filter**
 - Awarded to the entry that best balances performance, robustness, novelty, creativity, clarity of documentation, quality of the simulation setup, and overall engineering quality as judged by the jury.
 - **This is the main prize of the competition.**
- 2.2 Creativity award – most original design
 - Awarded to the entry with the most unique, creative, novel, or amusing concept or implementation.
 - Designs that do not fully meet all performance targets can still win this prize, as long as they are technically interesting and well documented.
- 2.3 Raw performance award – lowest-loss compliant filter
 - Awarded to the filter with the smallest passband insertion loss $|S_{21}|$ that still satisfies all mandatory filter requirements and simulation rules.
 - If multiple entries are within a very small margin, additional criteria such as robustness, manufacturability, and simulation quality may be used to break ties.

Only the winner of the first (overall) prize will receive physical items:

- A LiteVNA 64 vector network analyser worth approximately 190 euros.
- Two budget SMA cables with a bandwidth specified up to < 3 GHz
- An FR4 TRL calibration kit made specifically for this challenge.
- A PCB containing the winning filter layout, provided that:
 - A valid production-ready .GERBER file for the design was submitted and meets the PCB and manufacturability rules.
 - The design can be fabricated on the chosen 4-layer FR4 stack-up without unreasonable modification by the organizer.
 - In case of a submitted .GERBER file, the prize should suffice in performing TRL calibration and subsequent measurement of the filter.

3. Filter Design Requirements (Preliminary)

The challenge is to design an S-band band-pass filter on a 4-layer FR4 PCB. All designs must comply with the requirements below to be considered for judging.

- 3.1 The filter must be realized entirely on a 4-layer FR4 PCB as specified in the PCB specification section Section 7.
- 3.2 The complete filter layout, including all structures that affect RF behavior (traces, ground clearances, vias, components, and keep-out regions), must fit within either of the following PCB dimensions:
 - a 50 mm by 50 mm square
 - a 25 mm by 100 mm rectangular region
- 3.3 The filter must interface to the outside world through a 50Ω microstrip line on either the top or bottom outer layer of the 4-layer PCB.
 - 3.3.1 The launch microstrip line width is fixed at 1.0 mm.
 - 3.3.2 The reference plane for the launch microstrip line is the immediately adjacent internal copper layer above or below the chosen outer layer, with a separation of 0.5526 mm.
- 3.4 The nominal passband of the filter is from 2.3 GHz to 2.7 GHz (S-band).
- 3.5 Across the entire passband (2.3 GHz to 2.7 GHz), the insertion loss $|S_{21}|$ may not exceed 4 dB. (This figure may be adjusted during the competition if it is deemed difficult.)
- 3.6 The filter must exhibit a clear band-pass response: low loss in the passband between 2.3 GHz and 2.7 GHz, and high attenuation in the stopbands below and above this range.
- 3.7 The filter must provide stop-band rejection of at least 30 dB in both lower and upper stopbands, defined as:
 - 3.7.1 Lower stopband: all frequencies between 0.5 GHz and 2 GHz
 - 3.7.2 Upper stopband: all frequencies between 3 GHz and 5 GHz
- 3.8 The filter implementation must be passive (no active gain elements, amplifiers, or mixers) and must not require external tuning, biasing, or control signals during measurement. All tuning elements must be fixed at measurement time.

4. Participation conditions

Anyone may participate in this challenge, but depending on your country of residence it may not be possible to ship the physical prize.

- 4.1 People currently residing in the following countries are not eligible to participate or receive any prize: Russia, Belarus, North Korea, Iran, Syria.
- 4.2 Participants from the following countries or regions may submit entries and be ranked, but cannot receive any physical prize due to postal and/or regulatory limitations: Cuba, Venezuela, Afghanistan, Yemen, Libya, Sudan, South Sudan, Somalia, Central African Republic, Mali, Haiti, Myanmar, Lebanon, and parts of Eastern Ukraine.

- 4.3 Due to changing sanctions, export rules, and postal disruptions, the organizer reserves the right to update these lists or to refuse shipment to additional destinations if shipping becomes impractical, excessively risky, or legally restricted.
- 4.4 Postal addresses of winners for which insured shipping costs for the physical prize exceed 50 euros (calculated from Amersfoort, The Netherlands) will only receive the physical prize if they agree in writing to cover the amount exceeding 50 euros.
 - 4.4.1 If the first prize winner is not willing to cover the additional delivery costs, the first prize will be awarded to the next best eligible winner.
 - 4.4.2 If no eligible winner accepts the additional delivery costs, the physical prize may be withheld, but the competition results will still stand.
- 4.5 To have your filter manufactured on a PCB, you must provide a production-ready GERBER file.
 - 4.5.1 If no GERBER file is provided, the PCB of the winning design will not be included in the prize.
 - 4.5.2 If the GERBER file cannot be reasonably manufactured due to design or fabrication issues, the winner will be given up to 4 weeks after the declaration of the winner to submit an updated GERBER file. If no suitable file is received within this period, the PCB will not be manufactured, but the winner will retain their place in the competition.
- 4.6 Participation may be individual or as part of a team, including under the name of an organization, club, company, or other group.
 - 4.6.1 Each entry must designate a single contact person who will handle all communication with the organizer and who will receive any physical prize on behalf of the team.
 - 4.6.2 It is the responsibility of the team to decide internally how to share or use the prize.
- 4.7 Participants must be legally allowed to participate in this competition and to receive and use RF test equipment in their country of residence. Participation is void where prohibited by law.

5. Datapack Content

To be able to partake in the competition, you must submit a datapack containing all material needed to run, reproduce, and evaluate your design.

- 5.1 The datapack must be submitted as a compressed archive (.zip or another easily extractable format) and must include at least:
 - 5.1.1 A .py file that constructs the filter design and runs the simulation using EMerge version 1.3.x or later. The script must be self-contained apart from EMerge and clearly state any additional Python dependencies if needed.
 - 5.1.2 A separate .py file that loads the stored simulation data and performs post-processing (for example: plotting, calculating figures of merit, generating result images). This file must be runnable independently once the simulation data is available.
 - 5.1.3 A text file (plain text, markdown or .pdf) containing a technical description of the filter (minimum of 300 words, in English) explaining how it works and what its intended behavior is.
 - 5.1.4 Images or graphs that show the simulated performance of the filter. At minimum, the datapack must include:
 - An S_{11} and S_{21} magnitude plot in dB from 0.5 GHz to 5 GHz with at least 1001 frequency points. Points may be interpolated using vector fitting. The vertical axis must range from -60 dB to +5 dB and be clearly labeled.
 - A zoomed-in S_{21} magnitude plot covering 2 GHz to 3 GHz with at least 201 frequency points. The vertical axis must range from -5 dB to +1 dB and be clearly labeled.
 - 5.1.5 (optional) A GERBER file for a PCB implementation of the design that can be manufactured under the PCB rules defined in a later section.
 - 5.1.6 A short participant information file including:
 - The name or names of all participants credited with the design (individual, team, organization, club, or company name).
 - A postal address to which the physical prize can be sent, if applicable.
 - A valid email address that can be used for questions, clarifications, and winner notifications.

- 5.2 By submitting a datapack, participants agree that:
- 5.2.1 The datapack and the design it contains are not proprietary or confidential within the context of this competition.
 - 5.2.2 The organizer may publish the designs, figures, and simulation results (for example on a website, in documentation, or in presentations) so that all participants can learn from them.
 - 5.2.3 Personal details will be kept private except for the participant or team name. On explicit request, the participant or team name may also be anonymized in any public material.

6. Winning Criteria

All filters that fulfil the minimum filter requirements will be evaluated and judged by a jury of three industry experts. This jury will include at least Robert Fennis, the lead developer of EMerge; the two additional jury members will be announced later.

- 6.1 The designs will be evaluated **purely based on simulations performed** in EMerge on a computer selected by the jury. If the jury cannot reasonably reproduce a participant's results, the jury results will be taken as a final metric for each prize.
- 6.2 At all times, the jury will use its technical judgement to verify that the simulation is set up correctly and that the results are realistic.
- 6.3 **The selection procedure consists of three rounds:**
 - 6.3.1 In round one, the jury will review only the submitted designs, results, and written explanations. A selection of at most 20 designs will be made to proceed to the next round.
 - 6.3.1.1 Designs that are clearly set up incorrectly, show obviously unrealistic results, or appear to be plagiarized or directly copied from published research without proper attribution may be disqualified.
 - 6.3.2 In round two, the jury will inspect the simulation files in detail and run them locally to verify that the results are reproducible, sufficiently converged, and physically reasonable.
 - 6.3.2.1 If needed, other EM solvers or cross-checks may be used to understand discrepancies and distinguish modelling issues from normal numerical deviations.
 - 6.3.2.2 From this round, up to 10 candidates will be selected as finalists for the first (overall) prize.
 - 6.3.3 In the final round, the jury will select the overall "best" filter based on expert judgement.
 - 6.3.3.1 Filters will not be ranked solely on a single numerical figure of merit; robustness, clarity of design, documentation, manufacturability, and overall engineering quality will also be considered.
 - 6.3.3.2 Any filter that meets the mandatory specifications and rules can be considered for the first prize.
- 6.4 **Creativity award:**
 - 6.4.1 The creativity award is awarded based on the jury's subjective assessment of originality, elegance, humour, or unconventional ideas.
 - 6.4.2 Designs that do not fully meet all performance specifications can still win the creativity prize, as long as they comply with the general competition rules.
- 6.5 **Raw performance award:**
 - 6.5.1 The raw performance prize is awarded to the design with the lowest passband insertion loss, evaluated over the entire passband according to the defined filter requirements.
 - 6.5.2 Only designs that fully satisfy all mandatory filter and simulation criteria are eligible for this prize.
 - 6.5.3 If multiple entries are very close in performance, additional factors such as stability, robustness, and reproducibility may be used as tie-breakers.
- 6.6 The jury's decisions in all rounds, including interpretation of the rules and handling of borderline cases, are final and not subject to appeal.

7. PCB Simulation and Design Specifications

The PCB will be made by JLC PCB in China according to the following stackup:

- Stackup code: JLC04161H-7628B

< standard/Finished thickness1.59mm±10%		JLC04161H-7628A(Special/Finished thickness1.55mm±10%)		JLC04161H-7628B(Special/Finished thickness1.60mm±10%)		>	
Impedance (Ω)	Type	Signal Layer	Top Ref	Bottom Ref	Trace Width	Trace Spacing	Impedance trace to copper
50	Single Ended (Non coplanar)	L1	/	L2	1.0030	/	/
Layer	Material	Thickness (mil)		Thickness (mm)			
L1	Outer Copper Weight1oz	1.38		0.0350			
Prepreg	7628, RC 49%, 8.6 mil	8.58		0.2180			
Prepreg	7628, RC 49%, 8.6 mil	8.58		0.2180			
Prepreg	2116 RC54% 4.9mil	4.58		0.1164			
L2	Inner Copper Weight	0.60		0.0152			
Core	0.4mm H/HOZ without copper	15.75		0.4000			
L3	Inner Copper Weight	0.60		0.0152			
Prepreg	2116 RC54% 4.9mil	4.58		0.1164			
Prepreg	7628, RC 49%, 8.6 mil	8.58		0.2180			
Prepreg	7628, RC 49%, 8.6 mil	8.58		0.2180			
L4	Outer Copper Weight1oz	1.38		0.0350			

7.1 FR4 Layer thicknesses:

- 0.553mm
- 0.400mm
- 0.553mm

PCB Design constraints:

- 7.1 Minimum via hole size: 0.3mm
 - 7.1.1 Minimum via pad diameter > 0.4mm
- 7.2 Material: FR4 ($\epsilon_r = 4.4$, $\tan \delta = 0.02$)
- 7.3 Trace material: Copper
- 7.4 Trace Thickness: 35 μ m (top, bottom), 15 μ m (inner layers)
- 7.5 The design must be manufacturable according to the capabilities as summarized by JLCPCB: <https://jlcpcb.com/capabilities/pcb-capabilities>
- 7.6 Due to the high losses of the FR4 material, the copper traces may be simulated either with the physical thickness or as 2D PEC surfaces.

8. Simulation file rules

- 8.1 The simulation file must be made for a stable release of EMerge version 1.3.x or later.
 - 8.1.1 The exact EMerge version used (major.minor.patch) must be clearly specified near the top of the file (for example in a comment or variable) to ensure reproducible results.
 - 8.1.2 For verification, the jury will run the simulation using the latest available patch version for the specified minor release.
- 8.2 The filter must be defined and simulated strictly as a two-port network.
 - 8.2.1 Only two RF ports are allowed in the model; no extra ports for probes, diagnostics, or auxiliary terminations may be included.
- 8.3 Each of the two ports must be defined as either a modal port or a lumped port referenced to the adjacent ground plane (the internal layer directly above or below the excited outer layer).
 - 8.3.1 Excitation may be applied on either the top or bottom outer layer, but both ports must be consistent with the PCB stack-up and launch rules.
- 8.4 The EM model may not use lumped circuit components as part of the filter implementation.
 - 8.4.1 Ideal capacitors, inductors, resistors, or other lumped circuit elements (including equivalent networks) are not allowed inside the simulation model.
 - 8.4.2 Only geometric/EM structures (traces, planes, vias, cut-outs, etc.) may be used to realize the filter.

- 8.5 Absorbing boundary conditions or PML regions may not be included inside the physical filter structure.
 - 8.5.1 Standard outer absorbing boundaries or PML at the simulation domain boundary are allowed as required by EMerge, but may not form part of the functional filter topology.
- 8.6 The geometry must be fully defined in the Python simulation script.
 - 8.6.1 The simulation file may not import geometries from external files such as .step, .stp, .iges, .dxf, or similar CAD formats.
- 8.7 The simulation model must respect the resource limitations of the competition.
 - 8.7.1 The final mesh used for the production run may not exceed 150k tetrahedra as reported by EMerge. If adaptive mesh refinements are used by the jury or the participant, a fixed limit must/will be set at 150k tets.
 - 8.7.2 The script must run without manual interaction (no GUI-only steps, interactive prompts, or machine-specific hard-coded paths).
- 8.8 The frequency sweep used in the simulation must be suitable to generate the required S-parameter plots.
 - 8.8.1 The sweep must cover at least 0.5 GHz to 5 GHz and provide sufficient resolution to construct the required S-parameter plots (S_{11} , S_{21} and S_{22}) graphs as specified in the datapack rules.
- 8.9 The simulation file will be run by the jury to verify the results.
 - 8.9.1 If the jury determines that the mesh is abnormally coarse or that the solution is not clearly converged, they may re-run the same model with a finer mesh or adjusted solver settings.
 - 8.9.2 In case of significant discrepancies between the participant's results and the jury's verified results, the jury's rerun will be taken as the reference for ranking.

9. Eligibility and legal conditions

These rules clarify who can participate and under which legal conditions.

- 9.1 By submitting an entry, the participant confirms that:
 - 9.1.1 They are at least 18 years old, or have obtained permission from a legal guardian to participate.
 - 9.1.2 They are legally allowed to participate in such a competition in their country or region of residence.
 - 9.1.3 They are not subject to local, national, or international restrictions that would prohibit participation, receiving RF test equipment, or receiving materials by post.
- 9.2 The participant is responsible for complying with all applicable laws and regulations in their jurisdiction, including:
 - 9.2.1 Export and import restrictions related to RF equipment and PCBs.
 - 9.2.2 Local regulations on radio equipment, EMC, and test gear.
 - 9.2.3 Any rules related to competitions, contests, or prize draws.
- 9.3 The organizer may request proof of identity or eligibility if needed to verify compliance with these rules.
 - 9.3.1 If satisfactory proof cannot be provided within a reasonable time, the organizer may disqualify the participant or withhold the prize.

10. Submission, deadline, and format

These rules define how and when entries must be submitted.

- 10.1 Each participating team or individual may submit one main entry to the competition, unless explicitly permitted otherwise by the organizer.
 - 10.1.1 Additional "experiment" entries may only be submitted if clearly marked as such and if the organizer agrees to consider them.
- 10.2 All datapacks must be submitted before the official deadline specified on the competition page.

- 10.2.1 Submissions received after the deadline, even due to email or upload delays, may be rejected or only considered at the organizer's discretion.
- 10.2.2 The organizer may, in exceptional circumstances, extend the submission deadline. Any extension will be announced publicly in the same channel where the competition was announced.
- 10.3 Entries must be submitted using the method specified by the organizer (for example: email, upload link, or repository).
 - 10.3.1 The submission method, deadline (date and time in a specific time zone), and any additional instructions will be communicated separately.
 - 10.3.2 It is the participant's responsibility to ensure that files are not corrupted and can be opened with standard tools.

11. Communication and questions

These rules describe how participants can contact the organizer and receive updates.

- 11.1 All official communication about the competition, including clarifications and rule updates, will be made through:
 - 11.1.1 The main competition announcement page or repository.
 - 11.1.2 A designated email address or contact form.
- 11.2 Participants may ask questions about the rules, simulation setup, or PCB constraints.
 - 11.2.1 Answers that significantly affect interpretation of the rules may be published publicly (with personal details removed) so that all participants receive the same information.
 - 11.2.2 The organizer may decline to answer questions that would give one participant an unfair advantage or that require excessive support.
- 11.3 It is the participant's responsibility to check for updates or clarifications posted by the organizer during the competition period.

12. Misconduct, plagiarism, and disqualification

These rules explain what behaviour can lead to disqualification.

- 12.1 The following may lead to partial or complete disqualification from the competition:
 - 12.1.1 Plagiarism or copying of designs, code, or descriptions from other participants or from published research without proper attribution.
 - 12.1.2 Submitting simulation results that are knowingly falsified or manipulated to misrepresent performance.
 - 12.1.3 Attempting to influence or pressure the jury outside of the official communication channels.
 - 12.1.4 Any form of harassment or inappropriate behaviour towards other participants or the organizer.
- 12.2 Use of published topologies, textbooks, or research as inspiration is allowed, provided that:
 - 12.2.1 The participant clearly explains their own contribution or adaptation.
 - 12.2.2 Proper references or acknowledgements are included in the documentation where appropriate.
- 12.3 If a participant is disqualified, their entry will not be considered for any prize and may be removed from public materials at the organizer's discretion.

13. Measurement, manufacturing, and customs disclaimer

These rules clarify what is and is not guaranteed for physical prizes and measurements.

- 13.1 In case a winning design is manufactured on a PCB and/or measured:
 - 13.1.1 The organizer will make a reasonable effort to follow the submitted GERBER and rules, but minor adjustments (for example: pad shapes, via clearances, manufacturer constraints) may be necessary.

- 13.1.2 Measured performance may differ from simulated performance due to manufacturing tolerances, material variations, connector launches, calibration imperfections, and other practical limitations.
- 13.1.3 The organizer makes no guarantee that the measured performance will exactly match the simulated performance.
- 13.2 Customs, taxes, and import duties:
 - 13.2.1 Any customs duties, import taxes, or handling fees charged by the destination country are the responsibility of the prize recipient.
 - 13.2.2 The organizer will declare the contents and value of the shipment in a reasonable and honest way but cannot guarantee how local customs will treat the parcel.
 - 13.2.3 If a shipment is refused, destroyed, or returned by customs, the organizer is not obliged to resend the prize.

14. Data, privacy, and publication

These rules expand on how data and personal information are handled.

- 14.1 Technical data and designs:
 - 14.1.1 The organizer may store and process the submitted technical data (code, plots, descriptions, geometries) for the purposes of running, judging, documenting, and publicly presenting the competition.
 - 14.1.2 Designs, figures, and simulation results may be published online or used in talks, documentation, or future tutorials, as long as personal data is handled according to the privacy rules.
- 14.2 Personal data:
 - 14.2.1 Personal data (name, email, postal address) will be used only for:
 - 14.2.1.1 Contacting participants about their submission.
 - 14.2.1.2 Sending prizes to winners.
 - 14.2.1.3 Administrative and legal purposes related to the competition.
 - 14.2.2 Personal contact details (email, full address) will not be published.
- 14.3 Participants may request that their personal data be deleted after the competition has concluded, subject to legal retention requirements (for example, accounting rules for shipped prizes).

15. Changes to rules and cancellation

These rules handle unexpected events and modifications to the competition.

- 15.1 The organizer reserves the right to update or clarify the competition rules if:
 - 15.1.1 There are obvious mistakes, omissions, or contradictions discovered after the initial publication.
 - 15.1.2 Changes in software, PCB manufacturers, or practical constraints make parts of the rules unworkable.
 - 15.1.3 Legal, postal, or safety issues require adjustments to eligibility or shipping rules.
- 15.2 Any substantial changes to the rules will be:
 - 15.2.1 Documented with a date and a short explanation.
 - 15.2.2 Published in the same place as the original rules and, if possible, communicated to participants by email or through the main announcement channels.
- 15.3 The organizer also reserves the right to cancel or postpone the competition in case of:
 - 15.3.1 Major technical issues (for example, critical bugs in EMerge affecting fairness).
 - 15.3.2 Unforeseen legal, safety, or logistical problems.
 - 15.3.3 Insufficient number or quality of submissions to conduct a meaningful competition.
- 15.4 In the event of cancellation, no prizes are guaranteed to be awarded, and the organizer is not responsible for any costs incurred by participants in preparing their entries.

16. Prize delivery and warranty disclaimer

These rules clarify what is and is not guaranteed regarding the physical prizes, especially the VNA.

16.1 Prize availability and substitution

16.1.1 If, for reasons beyond the organizer's reasonable control (including but not limited to supply chain disruptions, stock shortages, export or import restrictions, changes in vendor conditions, or manufacturer discontinuation), the announced VNA model cannot be procured or delivered, the organizer may:

- Replace it with a reasonably comparable vector network analyzer or RF-related measurement prize of similar or higher approximate value, or
- Offer an alternative prize (for example a voucher or store credit) of similar approximate value, at the organizer's discretion.

16.1.2 The participant is not entitled to demand a specific model, brand, or configuration of the VNA, as long as the replacement is reasonably comparable in function and value.

16.2 No warranty by the organizer

16.2.1 The VNA and any other physical items are provided "as is" by the organizer.

16.2.2 The organizer does not provide any additional warranty regarding:

- Correct functioning of the device after shipping,
- Calibration accuracy or measurement performance,
- Suitability for any particular purpose or intended use.

16.2.3 Any manufacturer or vendor warranty that comes with the device will pass to the recipient where applicable. It is the recipient's responsibility to contact the vendor or manufacturer for warranty service, repairs, or calibration.

16.3 Shipping, risk, and delivery

16.3.1 The organizer will use reasonable care in packaging the prize and will ship it using a reasonable method (for example, tracked and/or insured shipping where practical).

16.3.2 Once the prize has been handed over to the shipping provider, the risk of loss, damage, delay, or non-delivery passes to the recipient.

16.3.3 The organizer cannot guarantee:

- That the prize will arrive within a specific time period,
- That the prize will not be delayed, damaged, lost, or held by customs,
- That customs authorities will allow import of the prize into the recipient's country.

16.3.4 If a shipment is delayed, damaged, lost, returned, or destroyed by the shipping provider, customs, or any other intermediary, the organizer is not obligated to:

- Re-send the prize,
- Replace the prize,
- Provide monetary compensation.

16.3.5 The organizer may, at their sole discretion and without obligation, attempt to resolve shipping issues or provide a replacement as a gesture of goodwill.

16.4 Customs and import responsibilities

16.4.1 Any customs duties, import taxes, brokerage fees, or handling charges in the recipient's country are the sole responsibility of the prize recipient.

16.4.2 The organizer will declare the shipment in a reasonable and honest way but has no control over customs decisions.

16.4.3 If customs require additional information, documents, or payment, it is the recipient's responsibility to provide these. Failure to do so may result in non-delivery without compensation.

17. Taxes, duties, and local obligations

17.1 Any taxes, import duties, brokerage fees, or other charges arising from receiving a prize are the sole responsibility of the recipient.

17.2 The organizer is not responsible for:

17.2.1 Determining the tax treatment of the prize in the recipient's country.

17.2.2 Paying any taxes or fees on behalf of the recipient.

17.2.3 Providing tax advice to participants or winners.

18. Intellectual property and third-party rights

- 18.1 By submitting an entry, the participant confirms that:
 - 18.1.1 They are the creator of the submitted design and files, or have obtained all necessary permissions to submit them.
 - 18.1.2 The entry does not knowingly infringe any third-party intellectual property rights (including patents, copyrights, trademarks, and design rights).
- 18.2 The participant grants the organizer a non-exclusive, worldwide, royalty-free license to:
 - 18.2.1 Store, run, and analyse the submitted design and code for the purposes of judging the competition.
 - 18.2.2 Use plots, images, and selected parts of the design and description in presentations, documentation, articles, and online material related to the competition and EMerge.
- 18.3 If a credible third-party claim of IP infringement arises, the organizer may:
 - 18.3.1 Suspend evaluation of the entry,
 - 18.3.2 Withdraw the entry from the competition,
 - 18.3.3 Remove or modify published material related to the entry,
 at the organizer's discretion and without compensation.

19. Liability limitation

- 19.1 Participation in the competition is voluntary and at the participant's own risk.
- 19.2 The organizer is not liable for:
 - 19.2.1 Any direct or indirect damage arising from participation in the competition.
 - 19.2.2 Loss or corruption of submitted data or files.
 - 19.2.3 Errors, bugs, or inaccuracies in the EMerge software or in any documentation provided.
 - 19.2.4 Any damage, malfunction, or loss resulting from the use or misuse of the prize, including the VNA, calibration kit, or PCB.
- 19.3 Nothing in these rules excludes liability where it cannot be excluded under applicable law.

20. Publicity, quotes, and use of submissions

- 20.1 The organizer may publish:
 - 20.1.1 The participant or team name (or chosen alias),
 - 20.1.2 Plots, images, and summary descriptions of the submitted designs,
 - 20.1.3 Non-confidential excerpts from the technical descriptions,
 for documentation, educational, or promotional purposes related to the competition and EMerge.
- 20.1 Personal contact details (such as email address and full postal address) will not be published.
- 20.2 On request, the publicly used name may be anonymized (for example, changed to initials, alias, or team name).

21. Governing law

These rules define which law applies in case of disputes.

- 21.1 This competition is organized from the Netherlands.
- 21.2 By participating, the participant agrees that:
 - 21.2.1 The competition rules are governed by the laws of the Netherlands.
 - 21.2.2 Any disputes that cannot be resolved informally will be handled under Dutch law, without prejudice to mandatory consumer protection laws that apply in the participant's country of residence.