

RaDiO HaMi

DAB+ Single Frequency Network at the SRAL Camp 2025: Technical Implementation and Field Experience

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About me



RaDiO HaMi

- M.Sc. in Computer Science (JYU, 2010)
- Board Member at SRAL, the Finnish Amateur Radio League
- Interested in SDR, broadcast tech, digital modes, frequencies between 87,5 MHz and 5850 MHz
- Free/Libre software activist
 - <https://github.com/zouppen/>
 - <https://chaos.social/@zouppen>
 - <https://matrix.to/#/@zouppen:hacklab.fi>

About Radio Hami

- Broadcast radio at the SRAL summer camp
- First operation in 1991 (*HimoHami 91*, Jämsä)
- Association (Radio Hami ry) formed in 2003
- Camp in July, in Finland
 - Between 2025-07-17 and 2025-07-20 in Hankasalmi
 - Between 2026-07-16 and 2026-07-19 in Tammela

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HamKarelia 2018, Nurmes

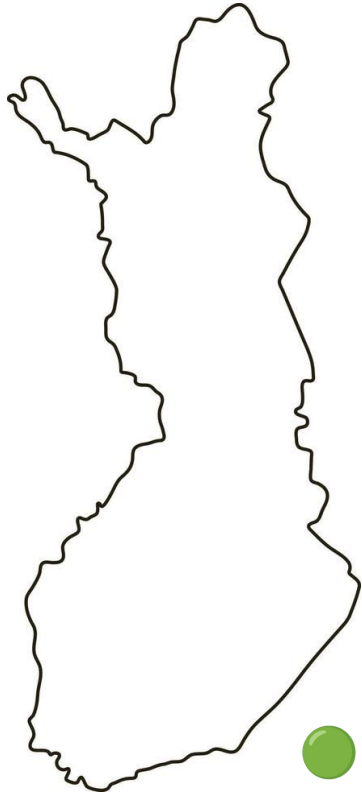
What is DAB? DAB+? #eurodab?




- DAB: Eureka-147 project starting from 1986 / 1987
- First demo at WARC-88 conference in 1988 in Geneva
- DAB audio codec is MPEG-1 Audio Layer 2 “.mp2”
- 🇳🇴 trials started first, on 1995-06-01
- DAB+ introduced in 2006
 - DAB+ audio codec is MPEG-4 HE-AAC v2
 - Better error correction (Reed–Solomon)
 - ETSI TS 102 563

- #eurodab is a 2025 song by Käärijä & Baby Lasagna, totally unrelated



DAB in Finland & Nordics



- Unlike many civilized countries such as , in Finland there are no regular DAB+ broadcasts
- Nordic & Baltic progress:
 -  DAB 1995– DAB+ 2010–
 -  DAB 2002– DAB+ 2017–
 -  DAB 1995– DAB+ 2019–
 -  DAB 2000–2005 DAB+ 2024–
-  as the outlier
 - Yle had DAB trial between 1997–2005
 - Radio Hami: DAB & DAB+ July 2024 & July 2025
 - Vappuradio JKL: DAB+ April 2026

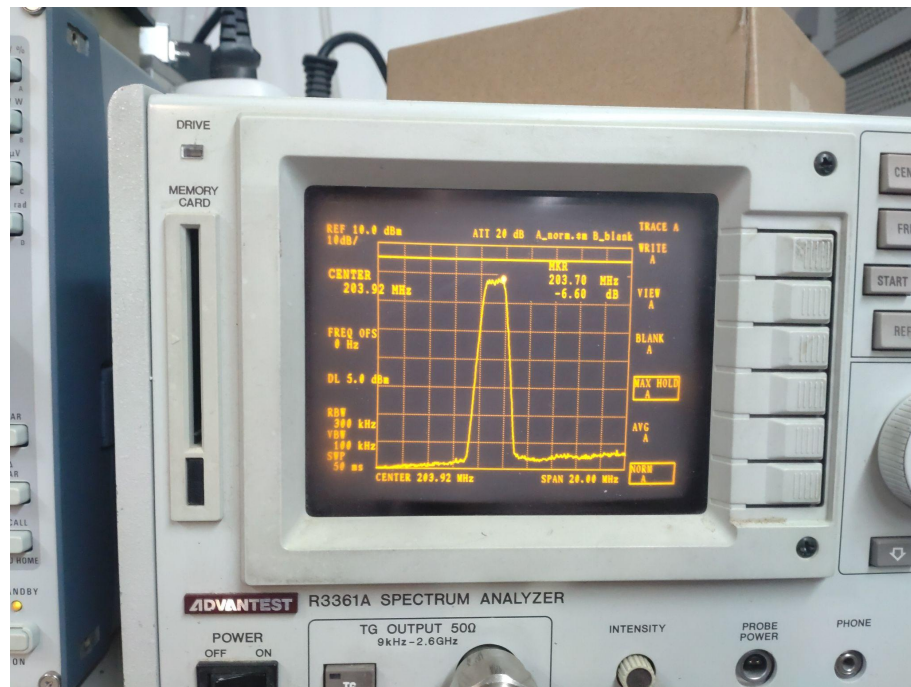
 DAB/DAB+ coverage area

*Only 50W ERP licenses,
strictly for testing.*

Clearly on the spectrum

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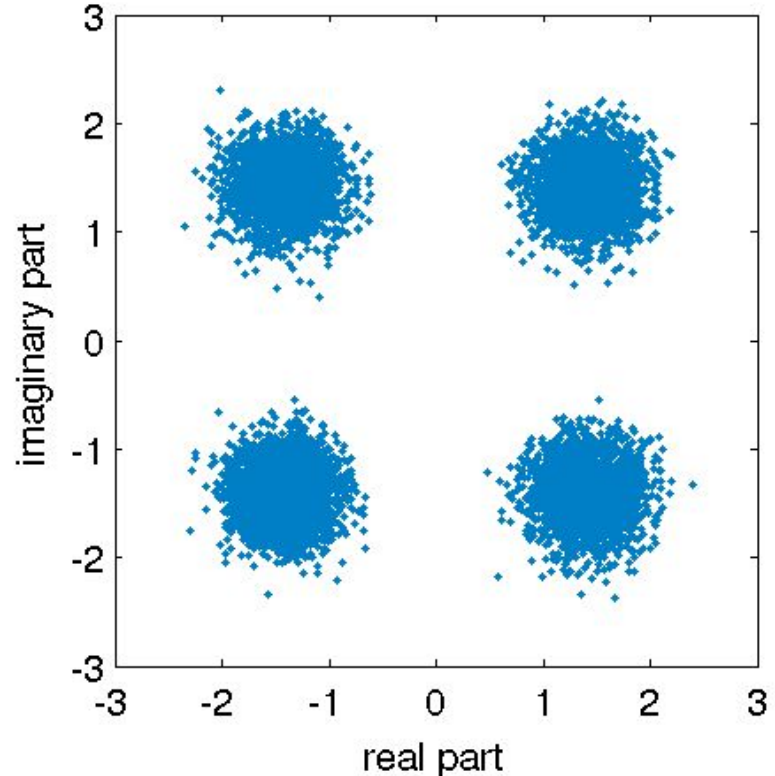
- Covering “Transmission mode 1”
 - Others modes are irrelevant
- VHF band III 174–240 MHz
 - National allocations vary
 - Shared with DVB-T/T2
- Ensemble RF bandwidth 1,536 kHz
- OFDM, QPSK (“4-QAM”)
- 1,535 subcarriers, 1 kHz spacing
- Symbol rate: 1000 symbols/s
- Gross bitrate: 2,400 kbits/s



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The real part

- Inconveniences
 - 1.5 MHz RF BW even with a single station
 - Linear amplifier required – or DPD
- Conveniences
 - Maximum code rate of $\frac{1}{4}$
 - 3 error correction bits per 1 bit of information
 - We can have multiple programmes
 - Program Associated Data (PAD)
 - 192 kb/s AAC
- Comparable coverage to FM but superior audio quality!

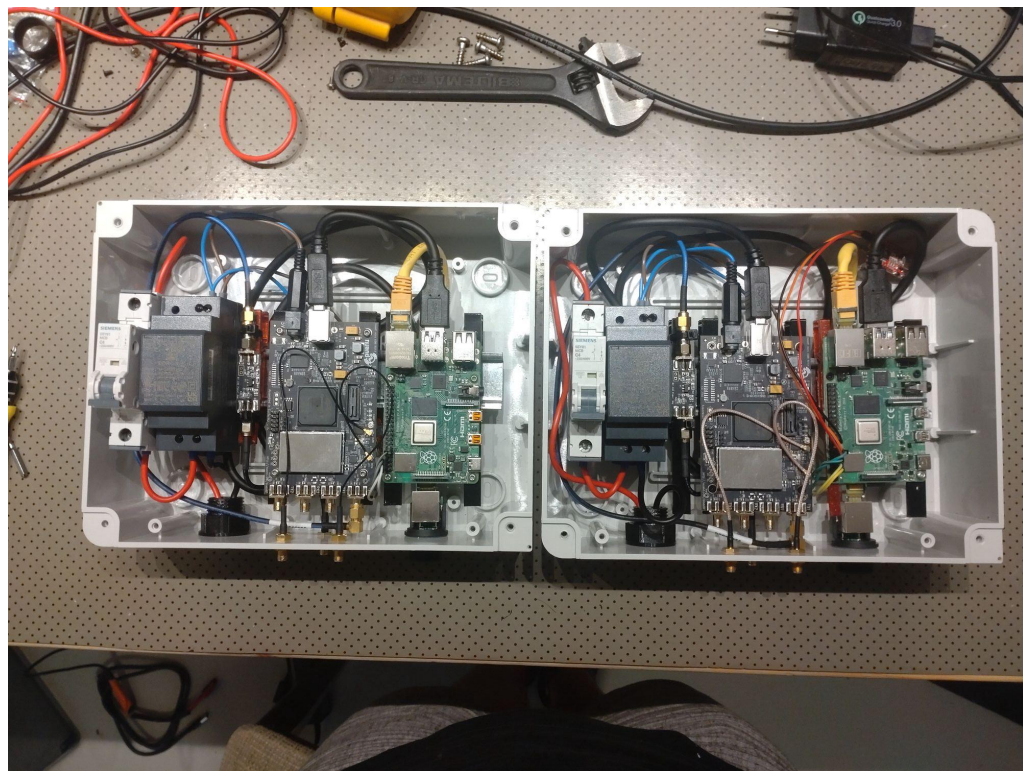


Single Frequency Network

- All transmitters synchronized
- 246 μ s guard interval
 - 74 km at the speed of light
- SDR: bladeRF 2.0 micro xA4
- Pretty easy to achieve with a modern computer
 - Raspberry Pi 4
 - GPS-DO PPS signal to GPIO
 - GPS-DO 10 MHz to BladeRF
 - chrony
- Mind signal levels and termination!
 - BladeRF lacks 50 Ω termination
 - Old Meinbergs have 5 V logic level, BladeRF is not 5 V tolerant!

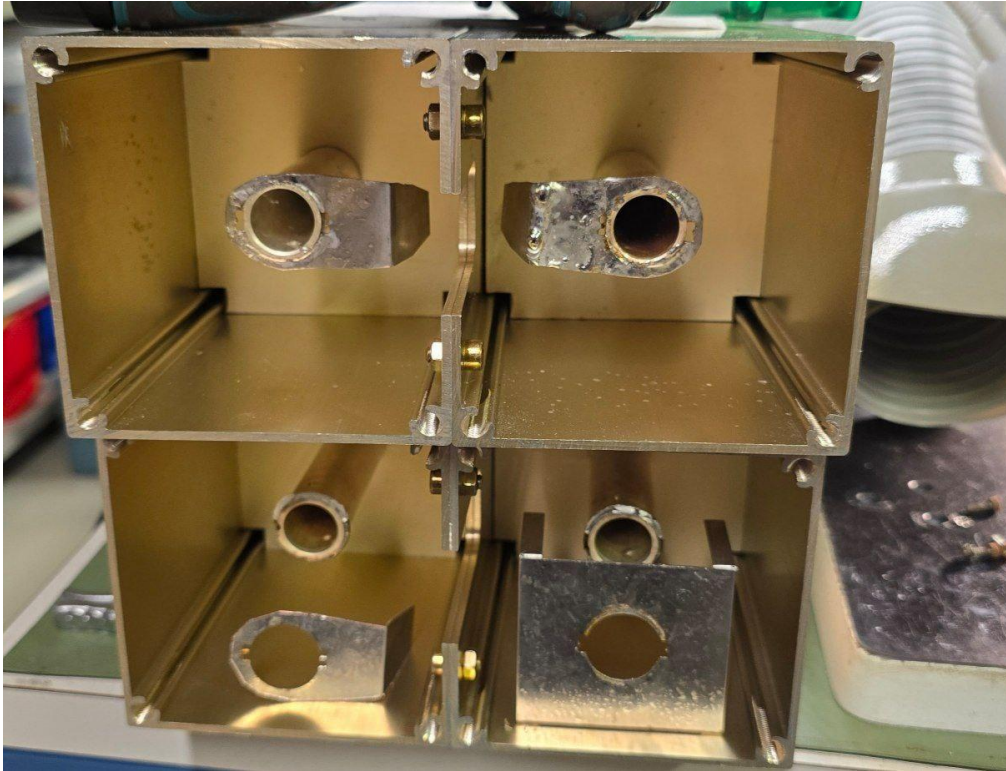
Practical setup 1/4: The SDR box

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Practical setup 2/4: Filtering

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Filters were supplied and tuned
by Vili OH5GE

Practical setup 3/4: PA

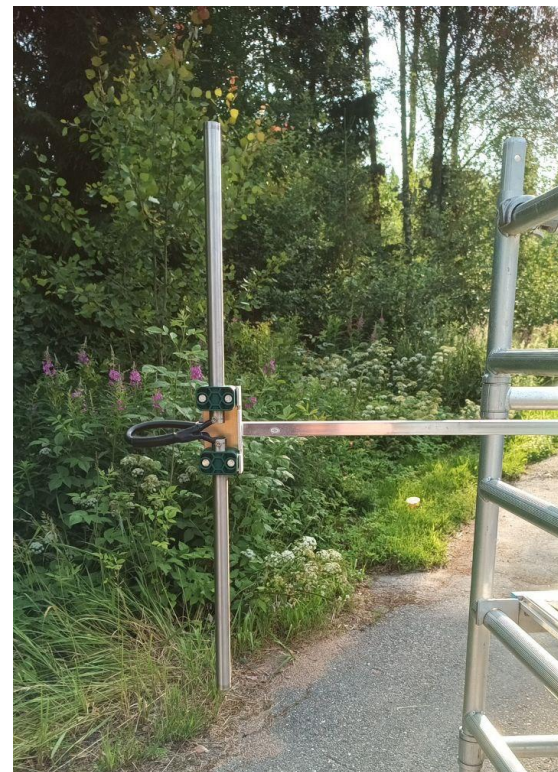
Pictures from this years
Vappuradio JKL setup,
same setup used in
2025



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Practical setup 4/4: Antenna

Antennas built by Ilkka
OH1LXF

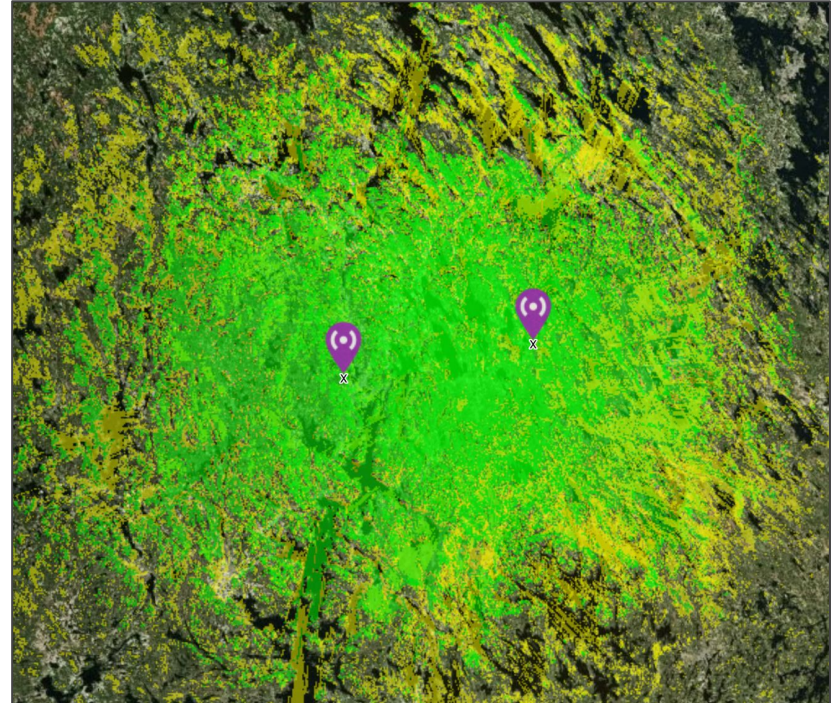


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The imaginary part

We didn't have time for everything, like..

- SPI – Service and Programme Information
 - The EPG
- DPD – Digital predistortion
 - Reduce power consumption
- FIR filter for compensating cavity filter
 - Allows use of narrower filters
- Proper SFN field testing
 - Needs overlapping coverages



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Equal Error Protection

Profile	Code rate 
EEP-1A	2/8 (1/4)
EEP-2A	3/8
EEP-3A	4/8 (1/2)
EEP-4A	6/8 (3/4)
EEP-1B	4/9
EEP-2B	4/7
EEP-3B	4/6 (2/3)
EEP-4B	4/5

References & more information

- <https://www.wohnort.org/dab/freqs.html>
- <https://localdab.org/>
- <https://www.sigidwiki.com/wiki/DAB>
- <https://en.wikipedia.org/wiki/DAB>
- <https://github.com/Opendigitalradio>
- <https://onlinelibrary.wiley.com/doi/pdf/10.1002/0470871431.app1>
- <https://www.nuand.com/product/bladerf-xa4/>

PS. Look mom, no AI! (almost no)

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Thank you!

Questions?