Why Digital?

Simple And Powerful

Chris Petersen, K9EQ

Agenda

About Yaesu

Why Digital? How does FM fit in?

Digital Technologies

Power and Simplicity of Fusion

What can I do with Fusion?

Q&A

Founder of Yaesu

Young Engineer who had a dream. Worked as a TV engineer in order to "put food on the table" Although "Times were Tough" in the Hasegawa household, Sako never lost his Passion for Radio.

With the Strong interest for his products from everywhere, a new company was created, YAESU MUSEN CO.,LTD in 1956.

Yaesu President Jun Hasagawa

Yaesu History

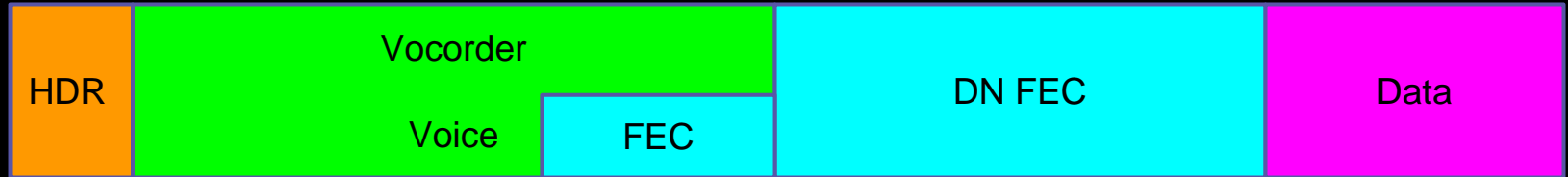100B

FT DX400

FL-20

FT-101

DX5000

FT-1000

# New Digital Technology : System Fusion

Digital Technologies

HDR	Vocorder		DN FEC	Data
	Voice	FEC		

Mode	Bit Rate	Voice	FEC	Bandwidth	Notes
Dstar	4,800	2,400	1,200	10 KHz	GMSK
IDAS/NXDN	4,800	2,400	1,200	6.25 KHz	C4FM
DMR	7,200	2,400 x2	1,200 x2	12.5 KHz	TDMA, 2 voice channels
Fusion DN	9,600	2,400	1,200	12.5 KHz	Greater FEC = +Range
Fusion VW	9,600	4,800	2,400	12.5 KHz	Better audio, lower FEC, less data

Spectrum Examples - Dstar & FM
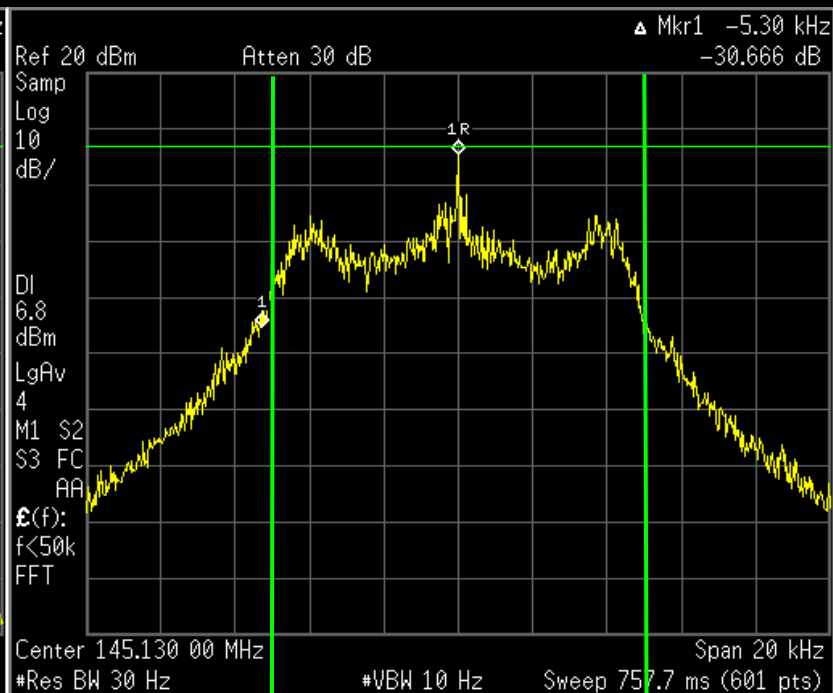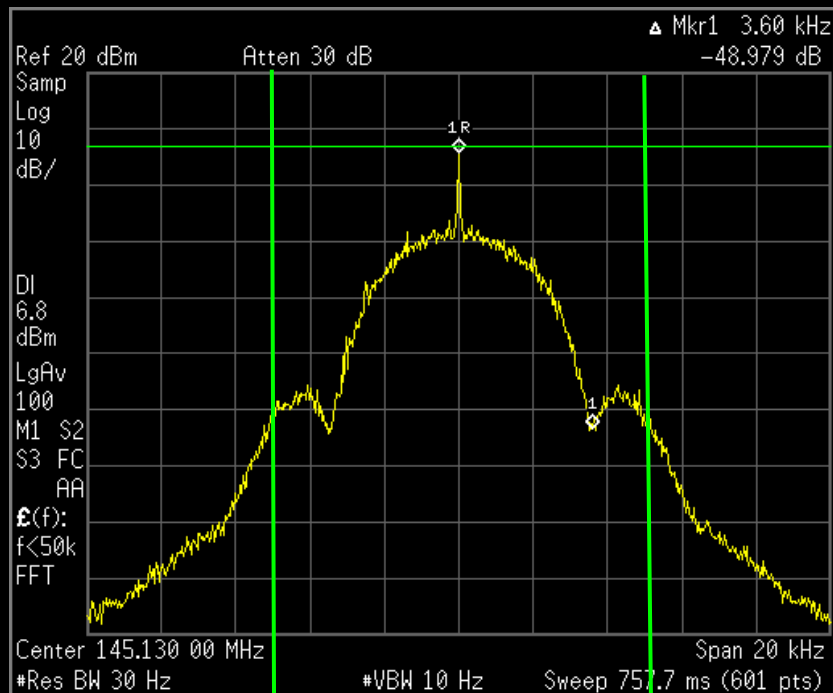
10 KHz span in green

C4FM Spectrum
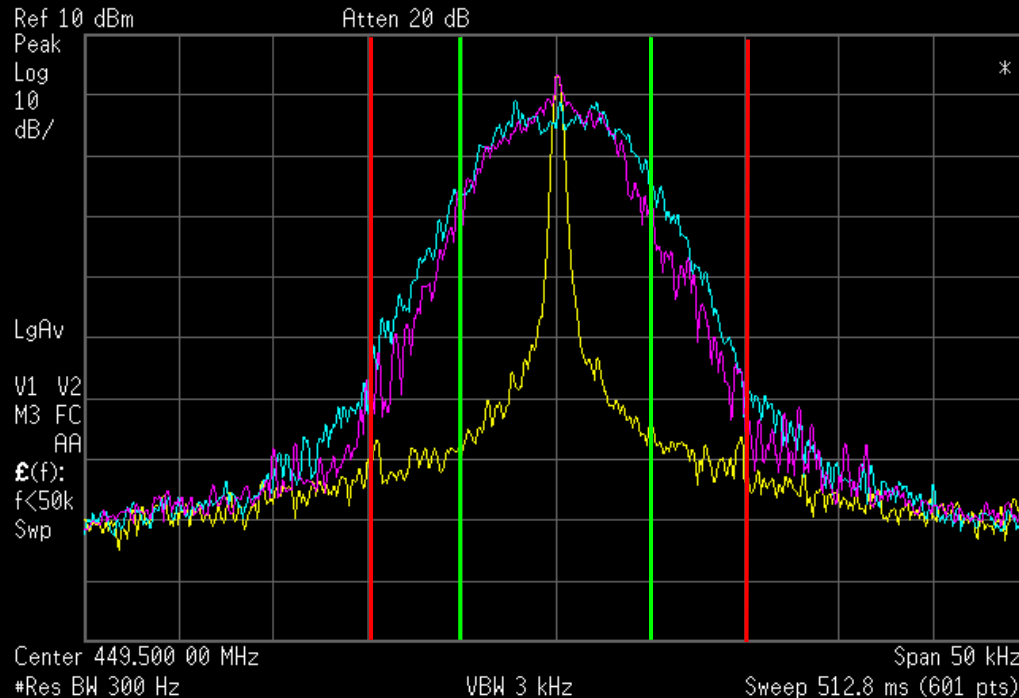
The **Magenta** (purple) trace is the C4FM signal.

The **Cyan** (blue-ish) trace is a +/- 5 kHz analog FM signal heavily modulated by a male voice.

The **Yellow** trace is the same transmitter with no modulation present.

20 KHz span in red

10 KHz span in green

Fusion Performance

- Improved audio quality (higher bit rate, newer vocorder)
- More robust (fewer and shorter dropouts)
- Easier (much easier) to use!!!!
- Better suited for Ham needs
- Follows where industry is going (GMSK is no longer used)
- Simplex, repeaters (Internet and RF linked), and Nodes

Networking

Network (Internet, RF)

Gateways (WiRES-X, DR-1)

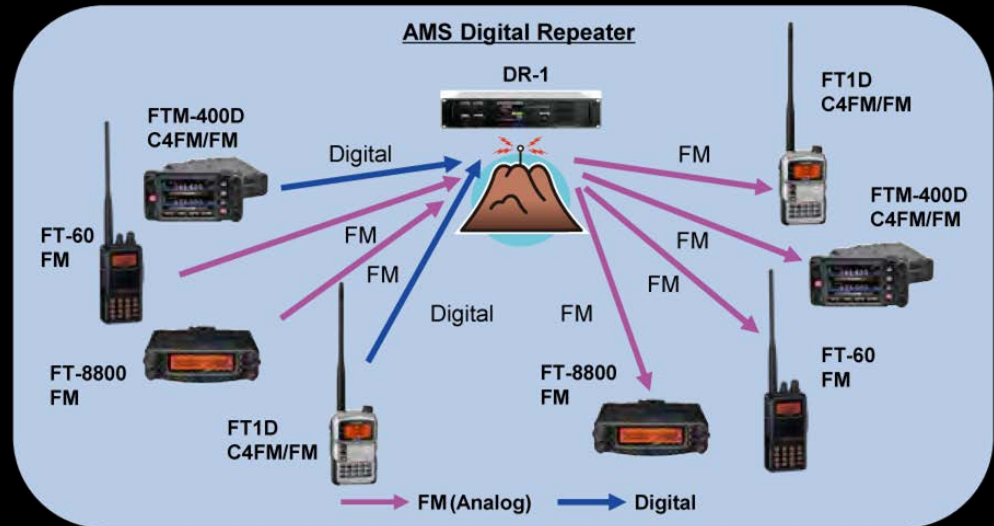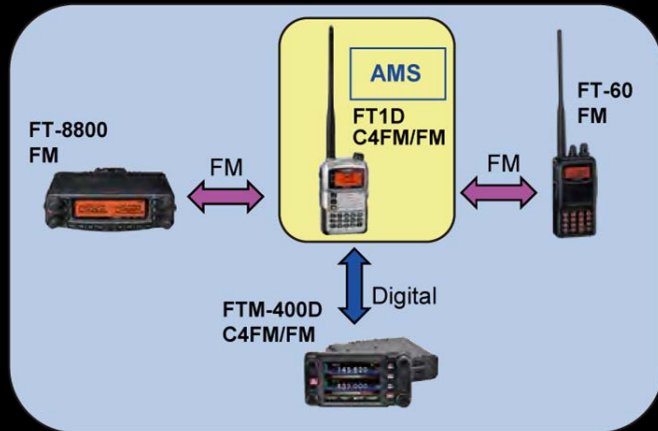Users (FT1/2, FTM-100/400, FT-991)

WiRES-X and Other Networks

Magic happens here

FCS

WiRES-X
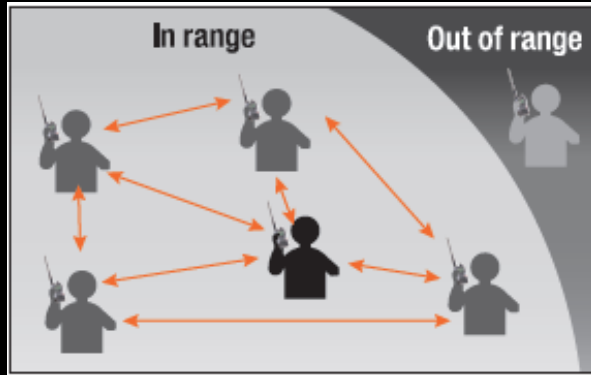
AMS (Automatic Mode Select)

FM Friendly Digital
Easy Migration
Co-existence

Automatically checks whether members registered to a group are within communications range of your transceiver. The group mode screen then displays information such as the Distance and Heading for each station registered to the group.

The MH-85A11U Camera microphone allows digital image transmission using the "Data" mode.

Fusion Future

The future of digital is not that it's digital, it's because it's compelling. It will be simple *and* powerful, allowing users to easily access a connected Amateur Radio world.

FM vs Digital

FM	**Traditional Digital**	**Fusion Reality**
Simple, easy to use	Complex	Simplicity and power
Variable on-air quality	Consistent	Improved and consistent
Good performance	No range improvement	Range greater than FM
Single stream/channel	Voice plus data	Voice, data, and control
Sense of community	Isolating	Bridging AMS + Network
Old and stagnant	Enabling	Broad future capabilities
Ad hoc architecture	Structured	Structured freedom

Minnesota Fusion Repeaters
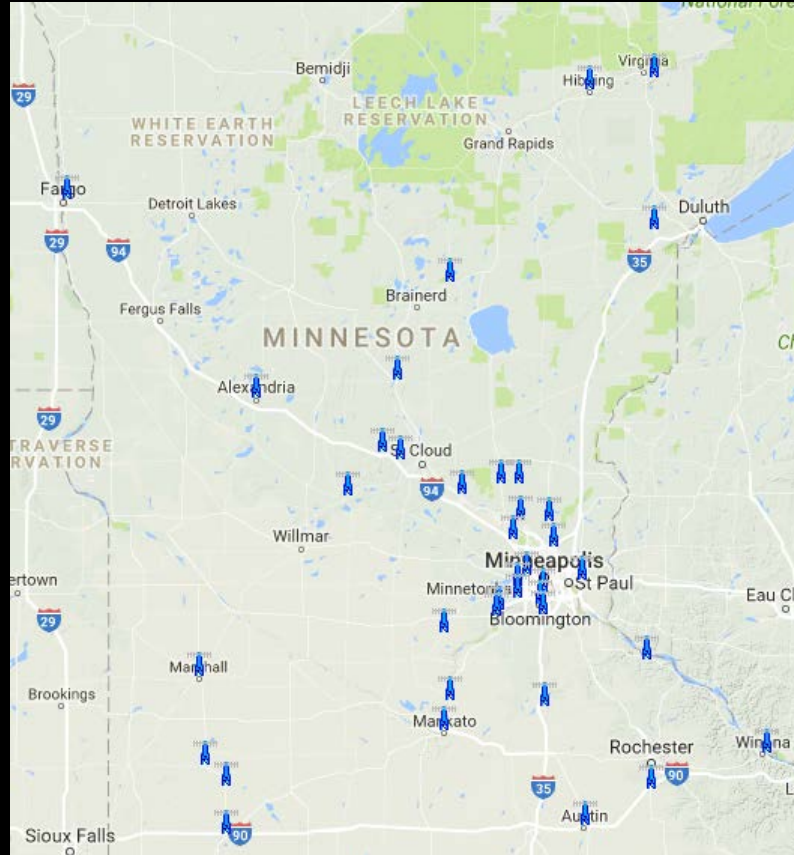
Wisconsin Fusion Repeaters
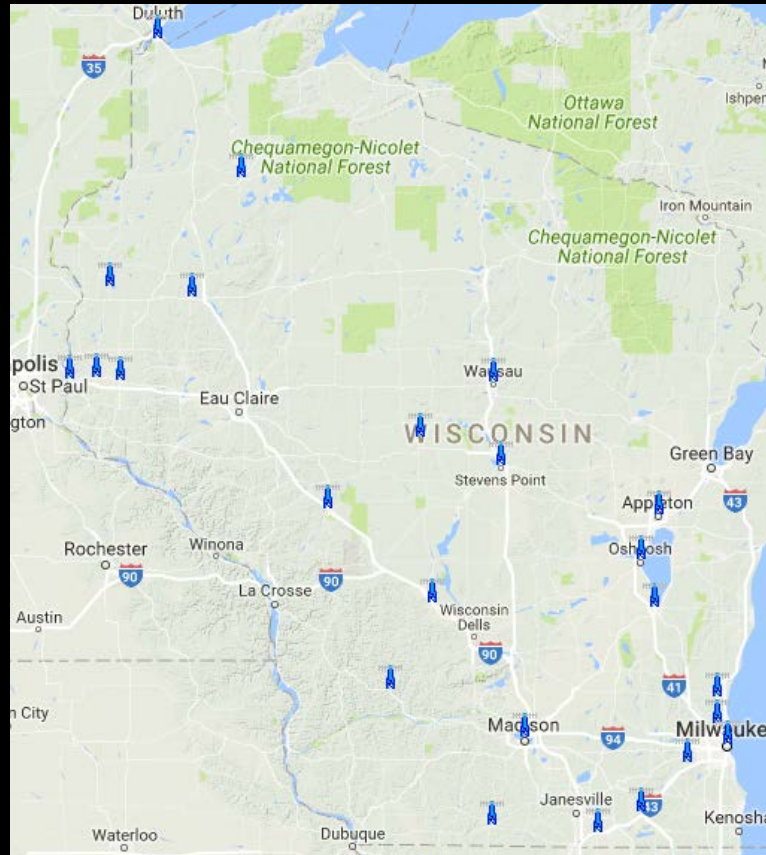
Does not include nodes

Iowa Fusion Repeaters

Digital Repeaters: World and US

Mode	US	World	MN	WI	IA
Fusion	1,460	1,692	42	32	28
Dstar	1,134	2,111	32	27	7
DMR	1,100	1,842	21	24	8
P25	235	254	2	7	6
NXDN	94	94	2	2	3

MNWIS Repeaters/Nodes

Oakdale	145.09	Digital Node
Chaska	145.23- 114.8	Analog
Paynesville	145.27- 85.4	
Richfield	145.39- D047	
Dayton	443.250+ D023	MNWIS Server
Becker	443.475+ 85.4	Reduced power
Avon	443.650+ 85.4	Wide area
Mounds View	444.075+ D025	Analog IRLP, EL, Bridge
Burnsville	444.300+ 114.8	Wide area
Mounds View	444.525+ D023	MNWIS Root

The Decade of Digital

Fusion's Future

K9EQ's Crystal Ball: "Fusion will be the dominant mode of operation on V/UHF within 10 years" - 3 October 2015

(We'll meet here in 2025 and see if I'm right.)

Fusion On The Air

Fusion Technical Net, Monday 7:30 PM Central

WiRES-X Room "----MNWIS", #21493
FCS002-23 (Minnesota) – DV4mini, Openspot
Streaming HamOperator.com - Internet

DARC

Becker

Paynesville

Avon

N0ANC

Bakken ARS - W0MDT 444.525

- DR-1 AMS/AMS RF linked to WiRES-X

- Bi-directional Digital/Analog to Analog bridge

- 2 Meter Remote Base

- Link to IRLP and Echolink

- 6 repeaters on site (all digital capable)

- W0MDT.com

HamOperator.com

MNWIS Stations Last Heard de K9EQ
WiRES-X Room #21493, Updated every 10 minutes

Sorted by date/time when the indicated Transmitter ID was heard.
Courtesy HamOperator.com Rev. Python=0.7

Do not bookmark this page - it will change. Use HamOperator.com/Fusion/WiRES-X

STATION	CALL	Tx ID	Net or Local	When Heard
N8XPQ-MIKE	N8XPQ-MIKE	F0pvi	Net	Fri Feb 17 23:21:31 2017
JE1NHF-ND	JE1NHF-ND	19446	Net	Fri Feb 17 23:14:59 2017
N5ICK-NICK	N5ICK-NICK	E56Fz	Net	Fri Feb 17 22:42:34 2017
AD0UU	AD0UU	F0CRn	Net	Fri Feb 17 21:45:46 2017
N0QK	N0QK	G09j9	Net	Fri Feb 17 21:45:33 2017
N7YO-JIM	N7YO-JIM	E0NV7	Net	Fri Feb 17 21:32:58 2017
N0ANC/SHAN	N0ANC/SHAN	E0RHv	Net	Fri Feb 17 21:25:19 2017
N8XPQ-MIKE	N8XPQ-MIKE	E5gQM	Net	Fri Feb 17 21:24:15 2017
KD0SGXMIKE	KD0SGXMIKE	F53CM	Net	Fri Feb 17 21:21:10 2017

Plus live Internet streaming

WIRES-X Nodes Connected to MNWIS de K9EQ

WiRES-X Room #21493

Updated every 10 minutes
Number of Nodes Listed: 99

Courtesy HamOperator.com
Report Created: Tue, 02 May 2017 11:51:41 Rev. XML=0.7, Python=0.8

Do not bookmark this page - it will change. Use HamOperator.com/Fusion/WiRES-X

User ID	ID #	A/D	City	State	Country	Freq	SQL	Comment
AB8VS-ND	30551	A	Owosso	Michigan	USA	146.445MHz		
AD0MI/R	11493	D	Lino Lakes	Minnesota	USA	443.250MHz+5.000MHz	DSQ:OFF	AD0MI-RPT, Dayton MN 443.250 www.mnwis.com
AD0MI/R-FM	11994	A	Lino Lakes	Minnesota	USA	145.550MHz	DCS:023	
AE0CX	....	F	......			0.0000 0.0000		FCS002-23 User
GB7IE-RPT	18693	D	Plymouth	Devon	UK	145.675MHz-0.600MHz	DSQ:OFF	
JDXA-TOKYO	16358	A	Setagaya-ku	Tokyo	Japan	430.71MHz	TSQ: 77.0Hz	ôJDXA TOKYO Open-Node(2020 Host-Town of USAI)
K0SXY-RPT	30089	D	des moines	Iowa	USA	145.310MHz-0.600MHz	DSQ:OFF	145.310 repeater Des Moines/Ames Iowa
K1CF	3133041	F	FN43FF			434.2000 434.2000		FCS002-23 User
K2AS	....	F	......			0.0000 0.0000		FCS002-23 User
K2SLI-ND	14165	A	Ae	Apo	Kuwait	145.920MHz	DCS:145	On-Air 19/2/17
K3MJW-RPT	11845	A	New Kensington	Pennsylvania	USA	449.525MHz-5.000MHz	TSQ:131.8Hz	Skyview Radio Society 444.525 repeater
K3RMO-ND	30215	D	Ellicott City	Maryland	USA	145.630MHz	DSQ:OFF	
K3SL-VE2-R	11830	A	Montreal	Quebec	Canada	444.150MHz+5.000MHz	TSQ:103.5Hz	
K3TI-RPT	18055	A	Reading	Pennsylvania	USA	145.490MHz-0.600MHz	TSQ:114.8Hz	Welcome to the K3TI node
K4CIO/V-RP	18492	A	Little Torch Key	Florida	USA	146.640MHz-0.600MHz	TSQ: 94.8Hz	Conch Republic VHF Reapeater System
K4WAK-RPT	11985	A	Crawfordville	Florida	USA	444.450MHz+5.000MHz	TSQ: 94.8Hz	
K5TAR-RPT	11809	D	Ingleside	Illinois	USA	440.81875MHz+5.000MHz	DSQ:OFF	Home Repeater of K9RUF "ruffers" 440.81875 MHz +5.00 MHz
K6IOK-ND	30448	D	Rocklin	California	USA	144.430MHz	DSQ:OFF	
K7CBJ-ND	18493	D	Kennewick	Washington	USA	144.300MHz	DSQ:OFF	Simplex Node 144.300 Digital Kennewick Washington
K7DRA-DAVE	11322	D	Rock Springs	Wyoming	USA	448.025MHz-5.000MHz	DSQ:OFF	

MNWIS Fusion Technology Net

Monday 7:30 PM Central

What's Next?

We've been given technology. What can _we_ do with it?

Experiment, learn, exchange, grow - communicate to whom we want, when we want, where we are!

Q&A

Information at HamOperator.com

Thanks! Chris, K9EQ