

**IEEE 802.3dm**

**14 AUG 2024 Ad Hoc teleconference**

**SAE J3117/3 2.5/5/10GBASE-T1 Shielded  
Balanced Single Pair Ethernet Cable  
Qualification and Validation**

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# Disclaimers

- SAE J3117/3 scheduled to be published CY2024.
- Not going to discuss the reasoning.
- Not going to discuss all details of the standard.
- I cannot give all details because it will be copyrighted.
- This PPT will focus on when the SI and shield performance testing is performed and at what temperatures.
- The purpose of this presentation is to provide the cable requirements of qualifying and validating shielded balanced pairs for the 802.3ch technology.

# Overview of SAE J3117/3

- The scope of this standard covers single shielded balanced pair (twisted or parallel) jacketed data cables intended for use in surface vehicles using 802.3ch technology.
- The testing in this standard is intended to qualify cables for normal operation in an automotive environment while maintaining the electrical properties for reliable data comm.
- First step is to classify the temperature range of the cable. TCR – Temperature Class Rating. This is the operating temperature. Class A – D (T1 – T4)
- This standard covers properties of the cables for various properties besides the SI parameters such as; break strength, ovality, materials, and construction.
- Covers jacket color as recommendation.
- Defines a 3000 hour heat age at the max TCR.
- Cable types specified in ISO and SAE documents.
- Defines Initial and Periodic testing of the cables. For periodic testing, perform the electrical performance testing at room temperature only. Periodic testing is normally performed once every 3 years or per customer requirements. The 3000 hour heat age testing is not required for periodic testing.

Class	Operating Temp (° C)	Temp Class Eq.	Typical Use in Vehicle
A	-40 to 85	T1	Interior (IP, Body, headliner, doors, liftgates)
B	-40 to 100	T2	Engine bay
C	-40 to 125	T3	Engine compartment
D	-40 to 150	T4	On or behind engine

# General Specs and Cable Construction

Description	Initial tests	Periodic tests
GENERAL SPECIFICATIONS		
Cable Types		
Single Core ISO Cable	X	
Single Core SAE Cable	X	
Outer Jacket (Sheath)	X	
Construction	X	X
Cable Breaking Strength	X	X
Ovality of Jacket (Sheath)	X	X
Electrical Performance		
Characteristic Impedance	X	X
Insertion Loss (IL)	X	X
Return Loss (RL)	X	X
Propagation Delay	X	X
Coupling and Screening Attenuation	X	X

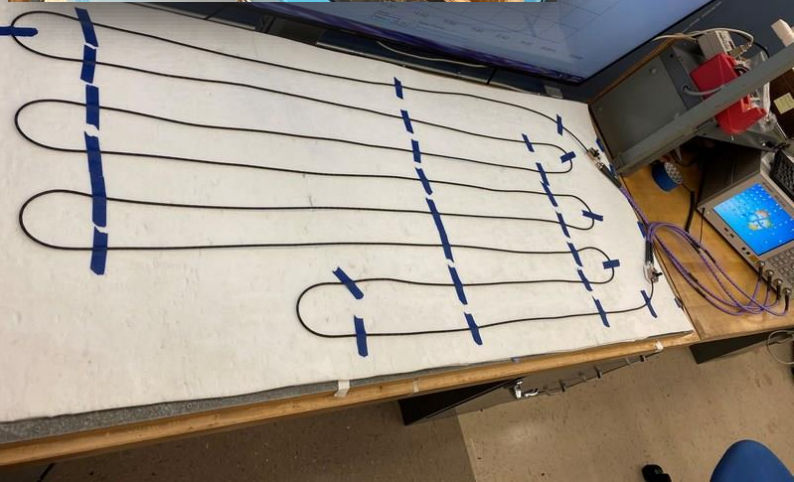
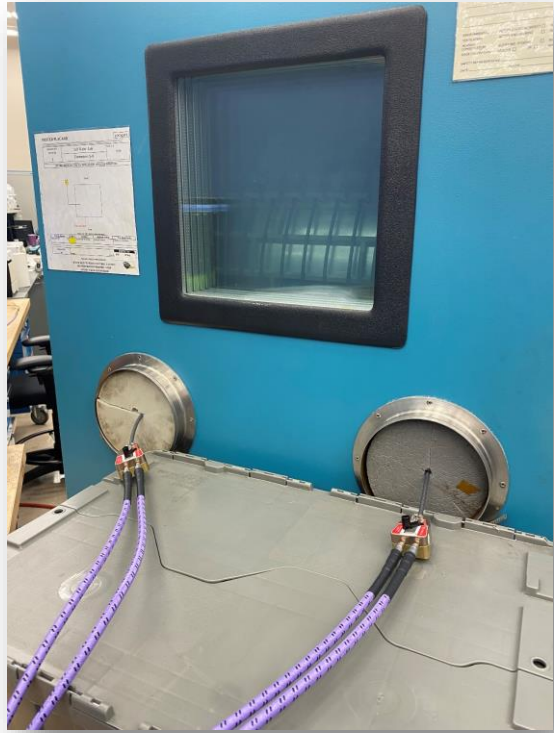
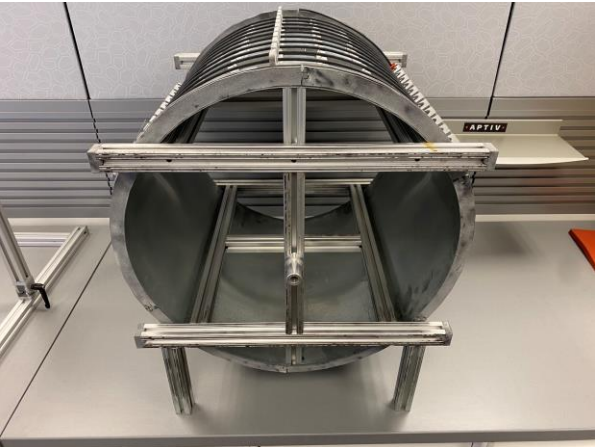
SAE J1678 Size (SAE Ga.)	ISO 19642-3 Size (mm <sup>2</sup> )	Conductor Material	Preferred Number of Strands	Conductor OD (Max) (mm)	Jacket OD
					Min-Max (mm)
26	0.13	Cu Alloy, Bare Cu, Tin Plated Copper	7	0.55	3.60 - 4.20
24	0.22	Bare Cu, Tin Plated Copper	7	0.70	4.00 - 5.60
22	0.35	Bare Cu, Tin Plated Copper	7	0.90	4.50 - 6.50
20	0.5	Bare Cu, Tin Plated Copper	19	1.10	6.00 - 8.00

# Electrical Performance Requirements

- Impedance, IL, RL, are tested at max TCR, room, and -40 °C.
- This is done for the initial and post 3000 hours heat age at max TCR.
- Either a 10 or 15 m sample length shall be used.
- Important to ensure the cable is properly heat aged so as not to violate contamination nor mechanical stress.
- Requirements based off OA TC9 and IEEE 802.3 clause 149.
- All requirements shall be met at max TCR, RT, and -40 °C; initial and post 3000 hour heat age.
- For coupling and shielding attenuation a 3.5 m sample is recommended and is only performed at room temp. This is done initial and post 3000 hour heat age.



# Typical Setup for SI Measurements





# Typical Setup for Shield Performance Measurements

