

Using SMA, 3.50mm, 2.92mm, 2.40mm and 1.85mm Microwave Connectors

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Abstract: There are a lot of different connectors available for microwave amateurs. These connectors have a big disadvantage; in relation to their size they are very expensive and mechanically sensitive. So often the question is asked: May I connect SMA standard connectors with 2.92mm standard? What is this for a special type of connector I have seen at the flea market? You will find some of the answers in this note.

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1 Compatibility of (SMA, 3.50mm, 2.92mm) versus (2.40mm, 1.85mm)

The connector 2.92mm is also known as a K-connector. The connector 2.40mm is also known as a Q-connector. The connector 1.85mm is also known as a V-connector. All the connectors SMA, 3.50mm, 2.92mm, 2.40mm and 1.85mm have different electrical specifications. SMA connectors have a dielectric interface while 3.50mm, 2.92mm, 2.40mm and 1.85mm connectors are air interface connectors. The air interface provides for a more repeatable connection with better electrical performance. A 3.50mm (Figure 1) or 2.92mm (Figure 2) or 2.40mm (Figure 3) etc. designation refers to the inside diameter of the connector's outer conductor. Please bear in mind, all electrical and mechanical systems have some manufacturing tolerances. In this document only nominal values are used. Please find the tolerances in the manufacturer's data sheets.

Figure 1, Figure 2 and Figure 3 show female type connectors.

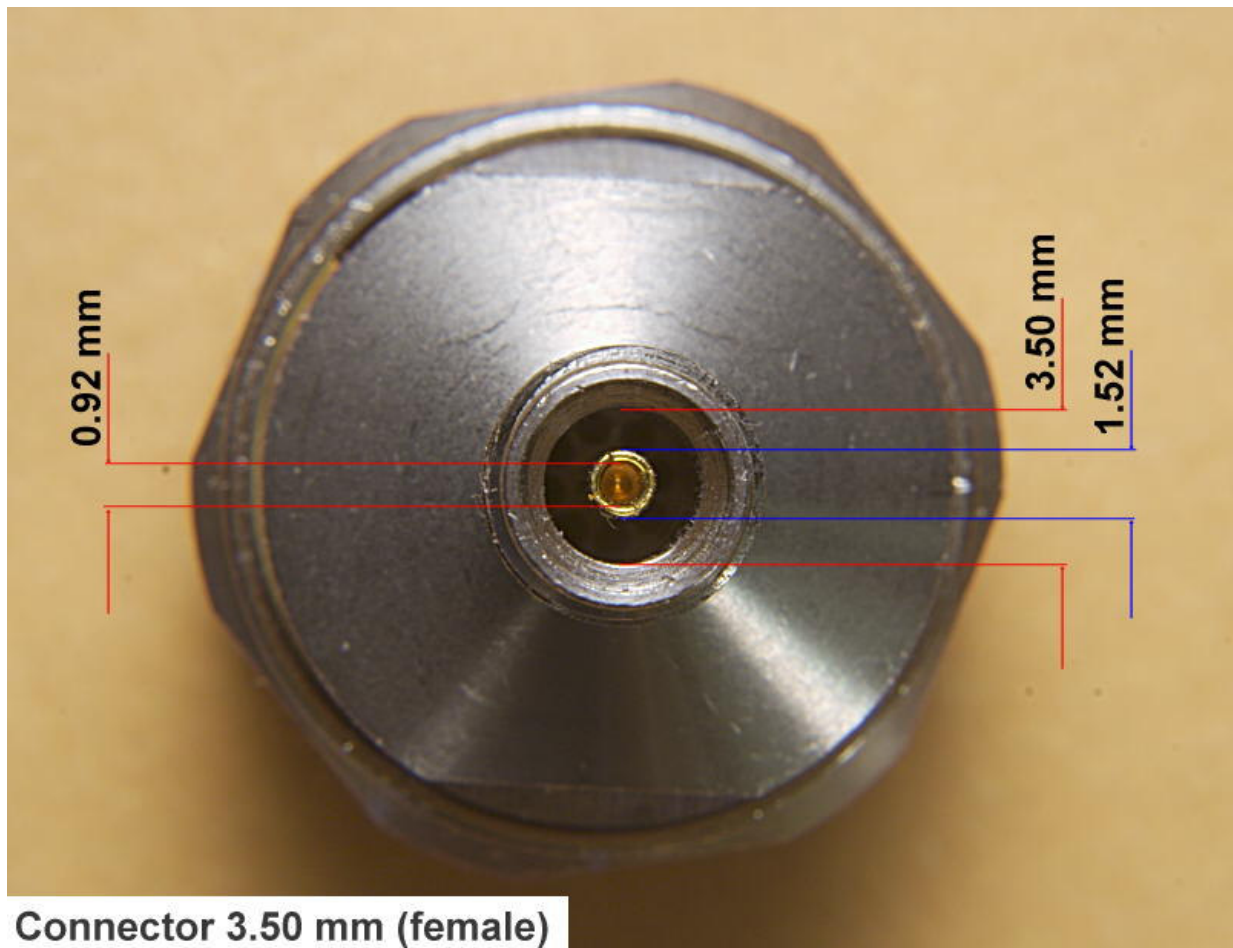


Figure 1: Connector 3.50 mm

The center connector's outer diameter also differs: 3.50mm -> 1.52mm, 2.92mm -> 1.27mm, 2.40mm -> 1.04mm, 1.85mm -> 0.804mm. The ratio between inner and outer conductors provides the 50-Ohm nominal impedance of these connectors. But this part of the inner connector does not provide the connectivity between the male and female connector.

The inner diameter of the inner connectors is equal for SMA, 3.50mm (Figure 1) and 2.92mm (Figure 2) connectors. This inner diameter is 0.92mm. Due to this circumstance, SMA, 3.50mm and 2.92mm connectors can connect together.

The inner diameter of the inner connectors of the 2.40mm (Figure 3) and 1.85mm connectors is 0.51mm. So also the connectors 2.40mm and 1.85mm can connect together.

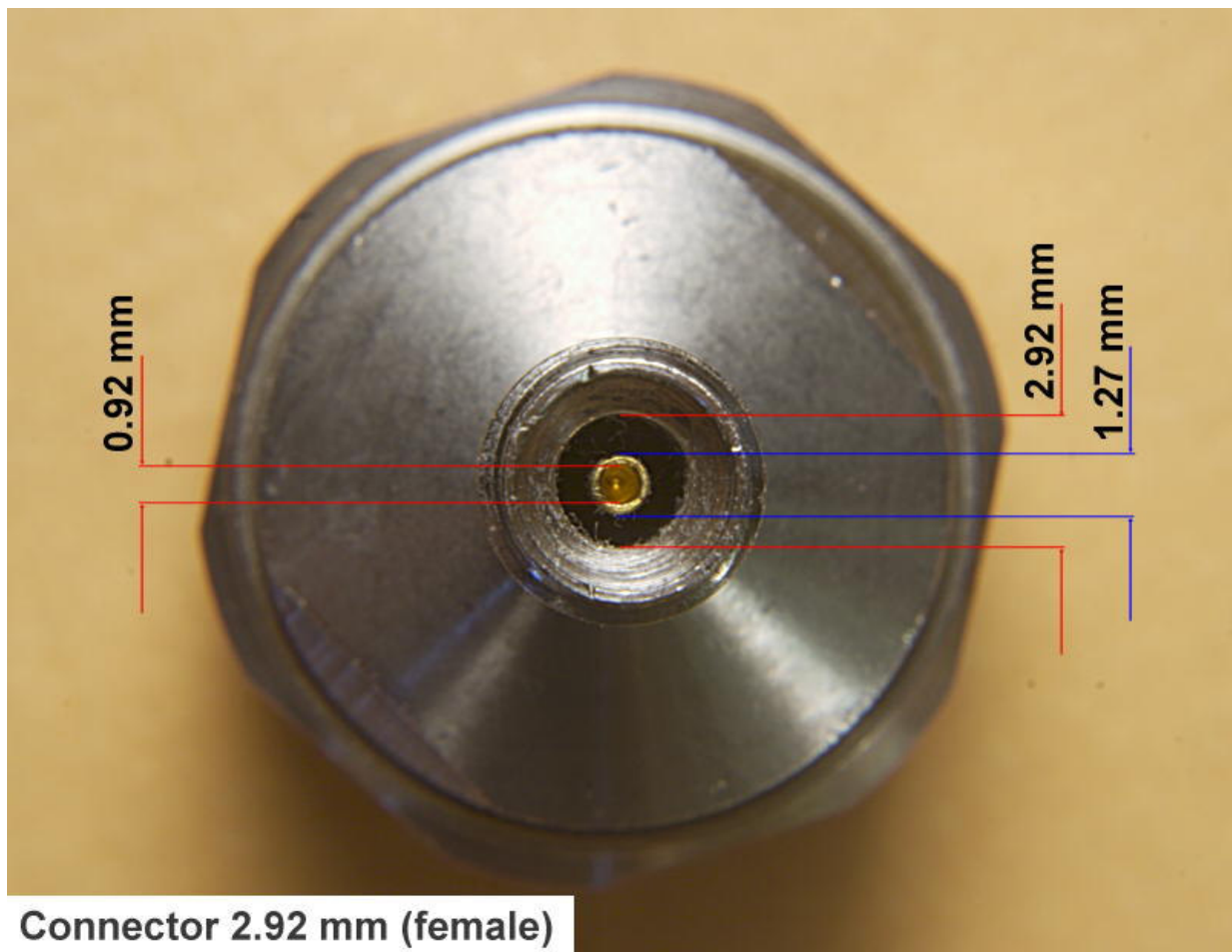


Figure 2: Connector 2.92 mm

Please bear in mind, this description of connecting together different connector types is in reference to only the mechanical data. The electrical data is always different for connecting different systems together. There is no electrical data available about connections between different standards, e.g. 2.92mm with 3.50mm. If you do measurements, please use one system only, which covers the appropriate frequency range.

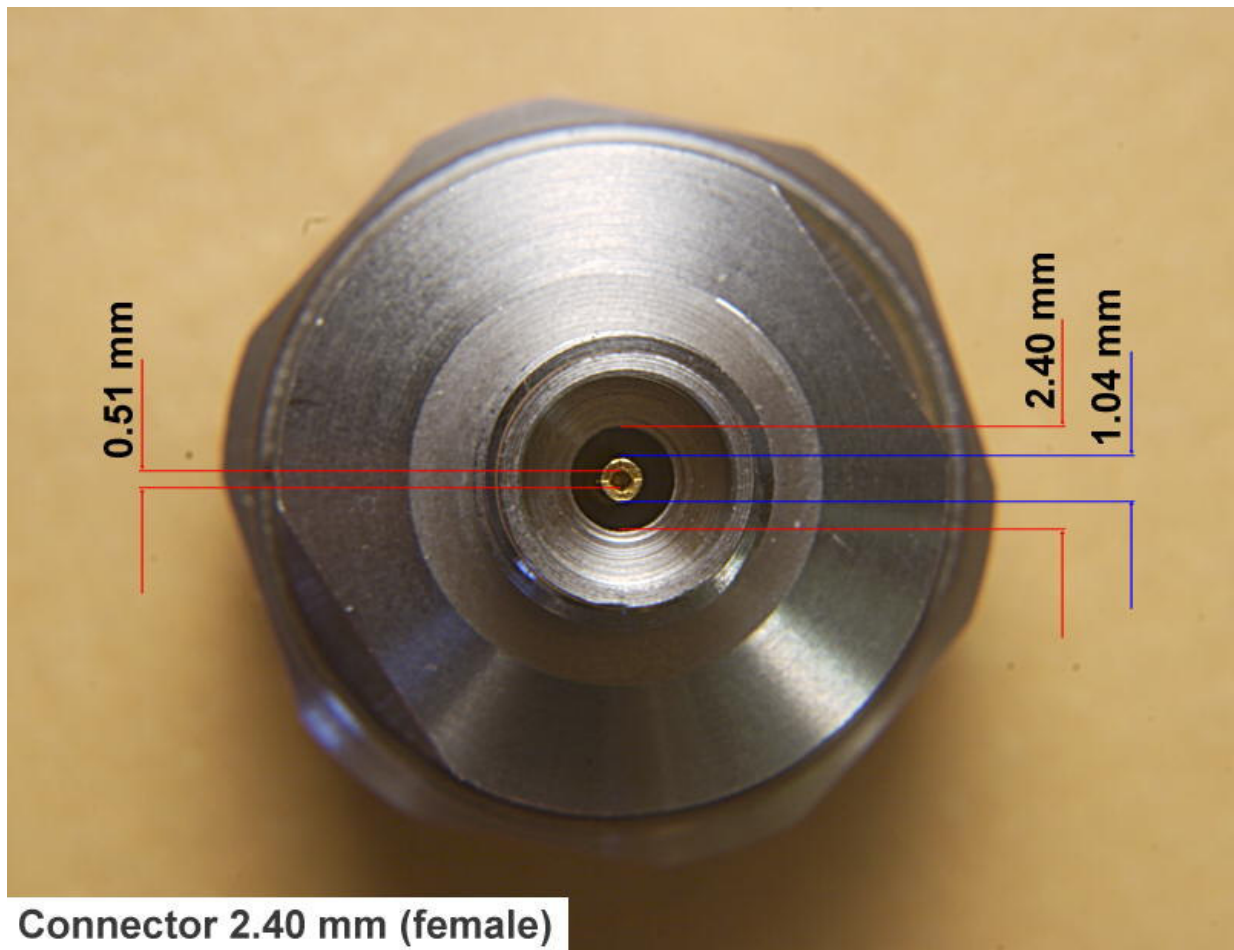


Figure 3: Connector 2.40 mm

2 The Thread of the Connectors

The SMA, 3.50mm and 2.92mm standards are equipped with 0.25 inch, 36 tpi (thread per inch) thread.

The 2.40mm and 1.85mm standards are equipped with a metric thread M7 x 0.75-6G. M7 characterizes a 7mm metric thread. The pitch is 0.75mm and is manufactured in the 6G-tolerance field.

Both threads are close in size and can accidentally be screwed together. But to do so, you need an unusual high torque.

3 Conclusion

You can mechanically connect together: SMA, 3.50mm and 2.92mm standards. The 2.92mm standard is also named the “K standard”.

You can mechanically connect together: 2.40mm and 1.85mm standards. The 2.40mm standard is also named the “Q standard”. The 1.85mm standard is also named the “V standard”.

Please compare the inner diameter of the inner conductor in Figure 1 and Figure 2 to the inner diameter of the inner conductor in Figure 3.

Caution

Even just trying to connect a wrong connector to a 2.40mm or 1.85mm female connector will destroy the inner conductor in an irreversible way. 1.85mm and 2.40mm connectors are very expensive.

4 Recommended Torque and Frequency Range

Table 1 gives an overview about the recommended torque range to tighten different kinds of connectors.

Table 1 also shows information on the highest frequency, which can be used by a specific connector. Please also refer to the manufacturer's data sheets. The specifications of selected connectors (measured by the manufacturer) may differ from the general information in Table 1.

Connector System	Frequency	Coupling torque recommended
N	18 GHz	0.68 Nm...1.13 Nm
SMA	18 GHz (some up to 26 GHz)	~0.56 Nm
3.50 mm	26.5 GHz	0.8 Nm...1.1 Nm
2.92 mm	40 GHz (some up to 46 GHz)	0.8 Nm...1.1 Nm
2.40 mm	50 GHz (some up to 60 GHz)	0.8 Nm...1.1 Nm
1.85 mm	65 GHz (some up to 75 GHz)	0.8 Nm...1.1 Nm

Table 1: Torque and Frequency Range of Connector Systems