PART I – DESCRIPTION

WBS Number: 1.7.1 (Continued)	**Title: Modular coil windings and coil assembly**
Originator: B. Nelson	

Description

General Description of Work to be Performed:

The modular coil set consists of three field periods with 7 coils per period, for a total of 21 coils. Due to symmetry, only four different coil shapes are needed to make up the complete coil set. The maximum toroidal field at 1.4 m produced by the modular coils with a flattop of 0.5s is 1.7 T. Figure 1 shows the general arrangement of the coil set. Table 1 summarizes the main modular coil parameters. The cross-section dimensions of each coil are 10.9 cm x 16.5 cm. Within this envelope is a 16 mm thick web that supports two multi-turn winding packs. The design concept uses flexible, copper cable conductor that has been compacted into a rectangular cross-section and wrapped with kapton and glass tape insulation.

The conductor is wound in a double pancake on each side of the structural web. When the first pancake has been wound, a chill plate is placed against the first pancake. The chill plates consist of a copper sandwich containing a serpentine cooling passage with inlet and outlet pipes for the gas cooling. Then the second pancake is wound. After winding is complete, the final geometry is verified and the assembly is vacuum pressure impregnated with epoxy to complete the insulation system. The epoxy fills the voids within the cable conductor so the winding pack becomes a monolithic copper-glass-epoxy composite. Auxiliary damping brackets are then installed. An illustration of a completed modular coil in the winding form is shown in Figure 2.

This element includes the conductor, insulation, winding, epoxy impregnation, clamp brackets, inspection and electrical testing.

Design
All drawings and analysis required for the modular coil set, including windings, structure, leads, cooling, and I&C are included in this WBS element (1.7.1)

R&D
At least one complete prototype coil will be fabricated. The cost is assumed to be five times the cost estimate for a production coil. This element includes all the R&D associated with the winding, winding pack, coil assembly and testing.

Materials and Subcontracts
All fabrication work will be performed by an industrial subcontractor via a fixed price or cost-plus award fee contract.

PART I – DESCRIPTION

WBS Number: 1.7.1 (Continued)	**Title: Modular coil windings and coil assembly**
Originator: B. Nelson	

Description

Fabrication and Assembly
Sub-assembly of the modular coils into field periods with the vacuum vessel is provided in WBS 7.

Installation and Testing
Installation of the modular coil assemblies onto the machine base is provided in WBS 7.

Description of Existing Equipment/Facilities to be Reused:

None

Description of Major Modifications Required to Existing Equipment/Facilities:

None
in WBS 7.

Installation and Testing
Installation of the modular coil assemblies onto the machine base is provided in WBS 7.

Description of Existing Equipment/Facilities to be Reused:

None

Description of Major Modifications Required to Existing Equipment/Facilities:

None

Parameter	Unit	Value	Remarks
Number of field periods		3	
Number of modular coils		21	
Number of turns per coil		32	
Maximum toroidal field at 1.4 m	T	1.7	Modular coils only
	T	2.0	Modular plus TF coils
Winding length along winding center	m	6.0-7.6	
Winding cross-section	cm^2	67	
Winding accuracy	mm	±1	

Table 1Modular coil parameters

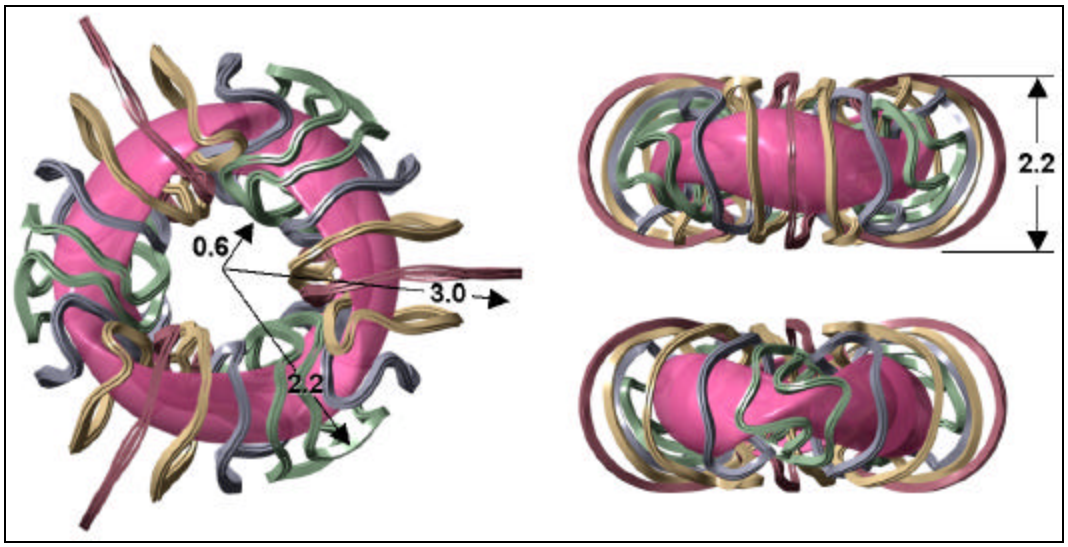

Figure 1 General arrangement of modular coil set

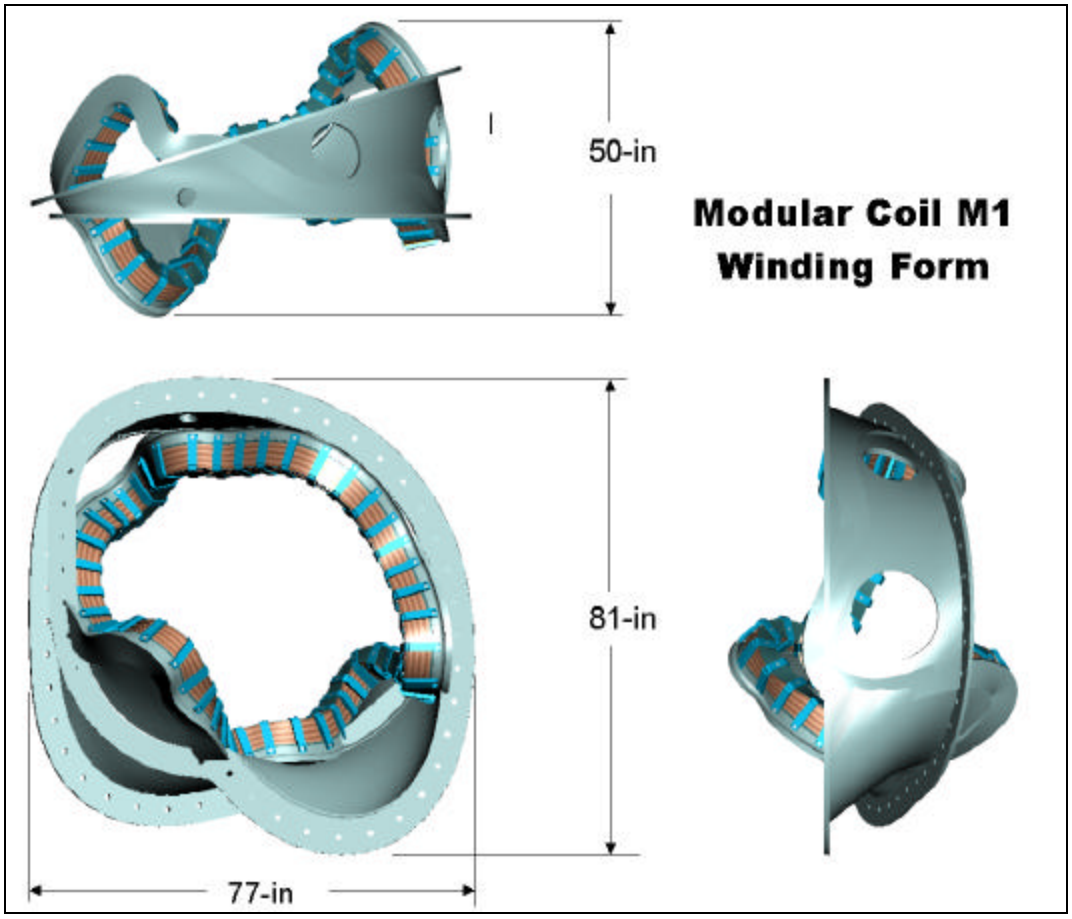

Figure 2 Completed modular coil in the winding form