

## Replacing a Motor Controlled Gunn (MCG) by a Synthesizer (A5OSC)

### Replacement instruction

This engineering note describes the procedure to replace a Motor Controlled Gunn (MCG) by a synthesizer type A5OSC. Because of the complexity of the procedure, it is strongly advised to do this in an indoor environment. During replacement one should take care that the surfaces of waveguide flanges are kept clean and are not damaged. Note that most screws have been locked with Loctite®.

#### Tools required

For the replacement the following tools are required (photo 1):

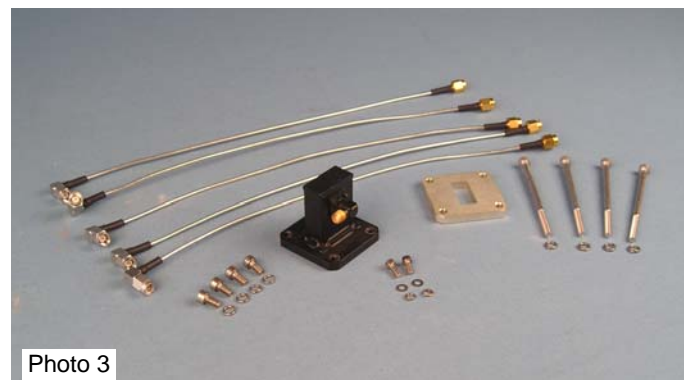
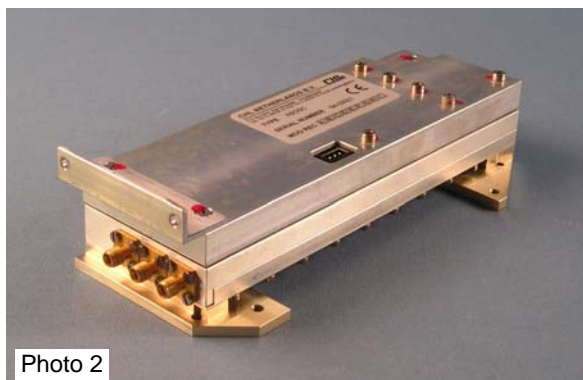
1. Metric open ended spanner no. 8.
2. Torque wrench for SMA connectors.
3. Hexagon key 2.5 mm.
4. Hexagon key 3 mm.



#### Parts required

The following parts are required (photos 2 & 3):

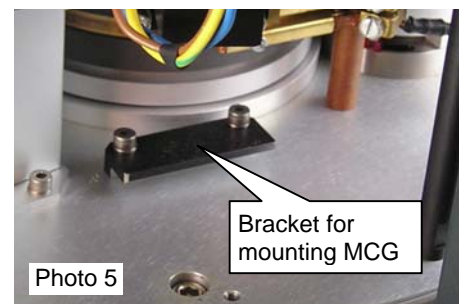
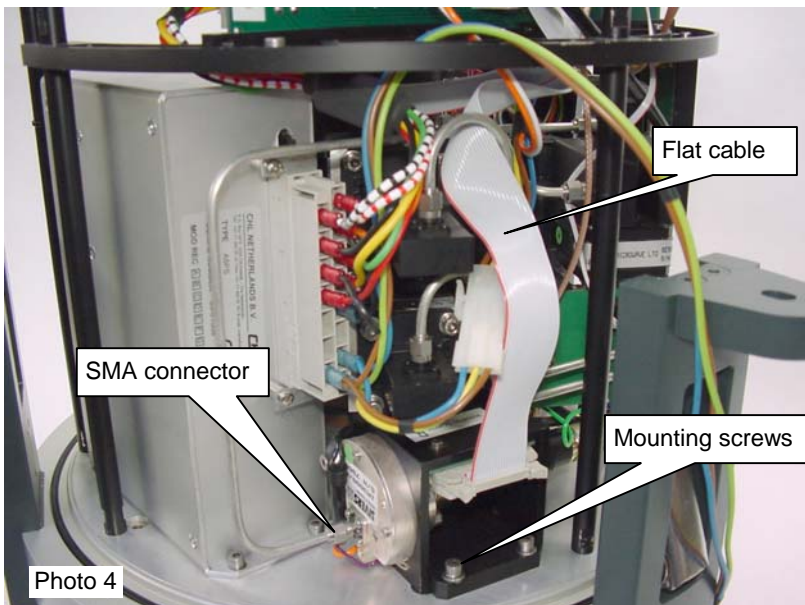
1. Synthesizer type A5OSC (photo 2).
2. Coax to waveguide transition.
3. Square waveguide flange.
4. Set of 5 flexible coaxial cables 28 cm with angled and straight SMA connector.
5. 2 stainless steel screws M3x6 mm with washers and spring washers.
6. 4 Stainless steel screws M4x8 mm with spring washers.
7. 4 Stainless steel screws M4x70 mm with spring washers.



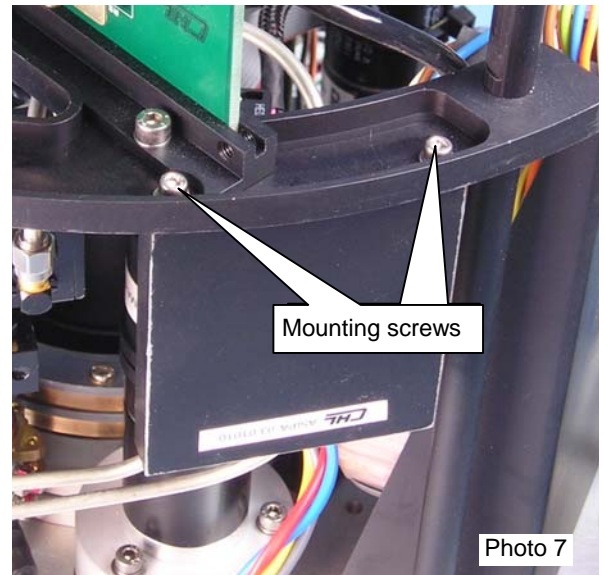
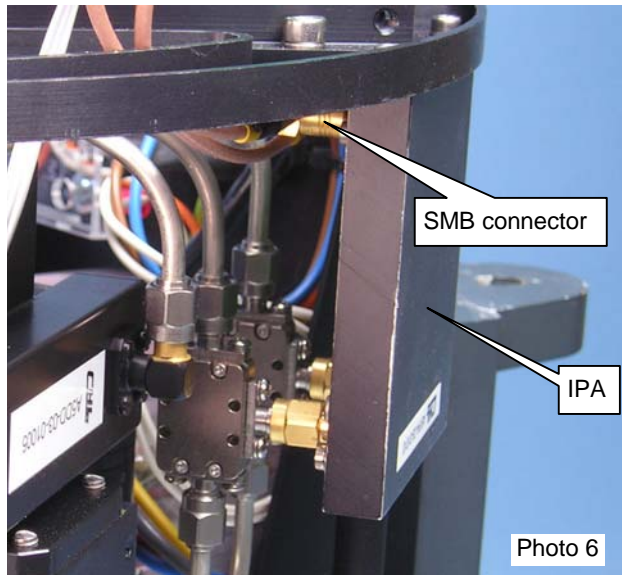
## Artemis MK5 Engineering Note EN5-5

### Replacement procedure

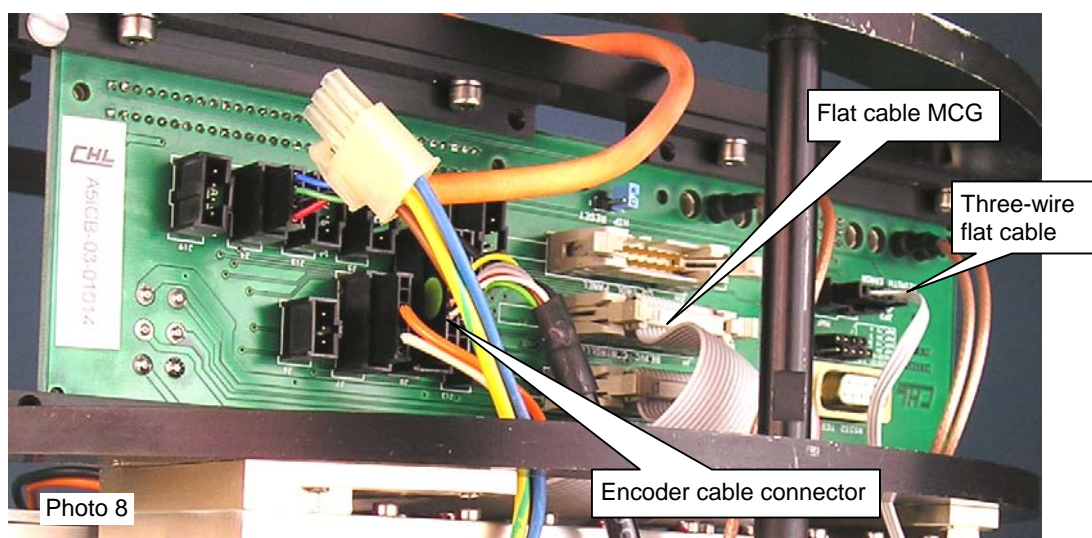
1. Remove the antenna from the Antenna Unit (AU) and put a protective cover on the antenna flange of the AU.
2. Switch off the 230 VAC supply to the AU.
3. Undo the three snap locks with which the Bottom Cover (BC) is fixed to the AU and lower the BC from the AU. Let the BC hang on the two straps provided for.
4. Disconnect the mains cable and the flat cable which connect the BC to the AU.
5. Remove the BC and put the AU upside down on its protective flange cover.
6. Unscrew the SMA connector of the semi-rigid coaxial cable connecting to the MCG.



7. Disconnect the flat cable from the MCG. Disconnect the cable at the interconnection board (back plane) as well and remove it completely. The cable must be used again later on.
8. Remove the two screws holding the MCG in place and take the MCG out.
9. Remove the two screws holding the bracket for fixing the MCG (photo 5). The bracket will not be used again.
10. Remove all semi-rigid coaxial cables from the system. Use a metric spanner no. 8 to loosen the SMA connectors. The semi-rigid coaxial cables will not be used again.

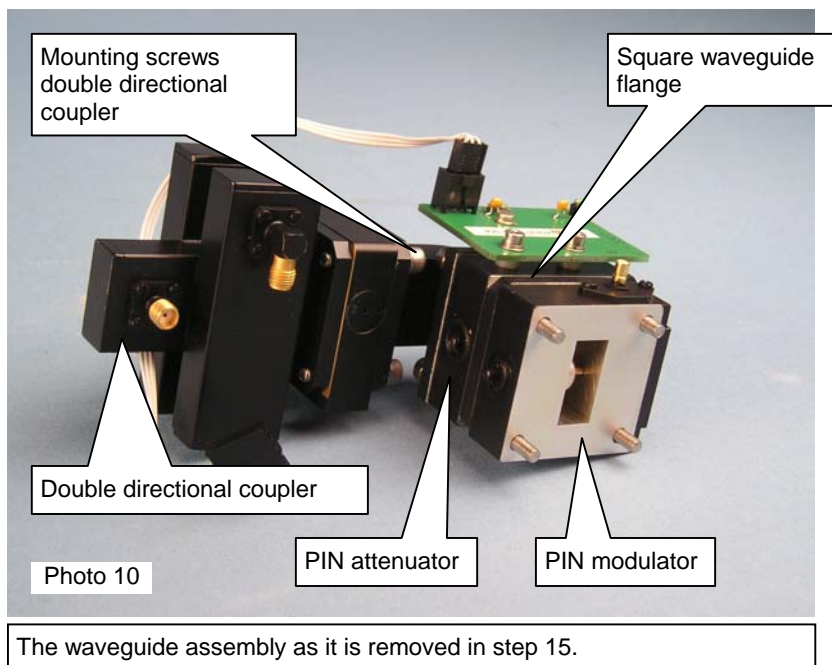
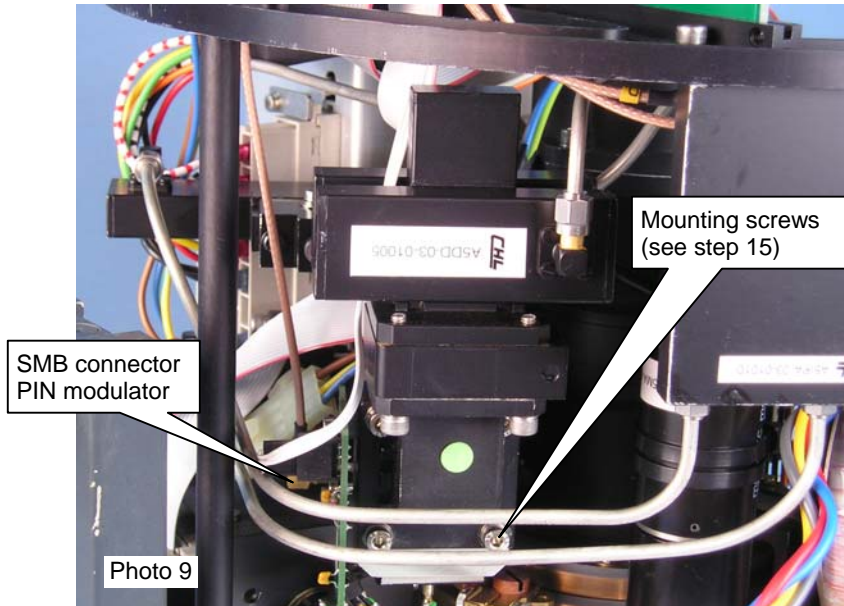


11. Remove the two coaxial cables from the IF Pre-amplifier (IPA) by pulling the SMB connectors from the IPA. See photo 6.
12. Remove the two screws holding the IPA in place and remove the IPA. The IPA will be used again later on.
13. Disconnect the three-wire flat cable from the interconnection board (back plane).

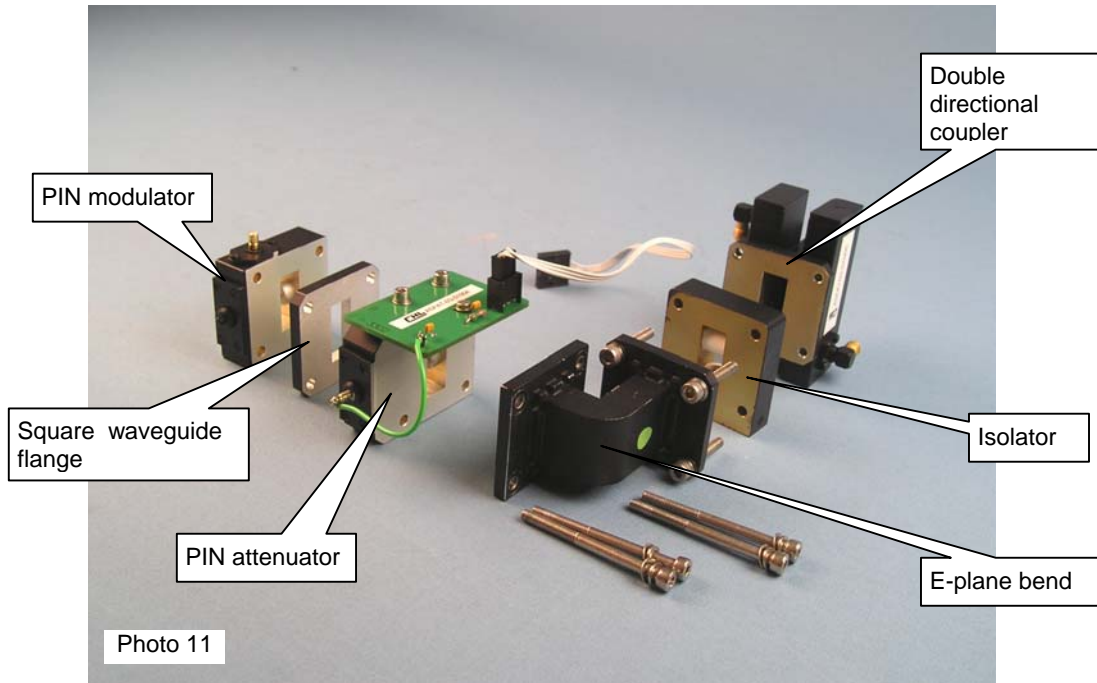


## Artemis MK5 Engineering Note EN5-5

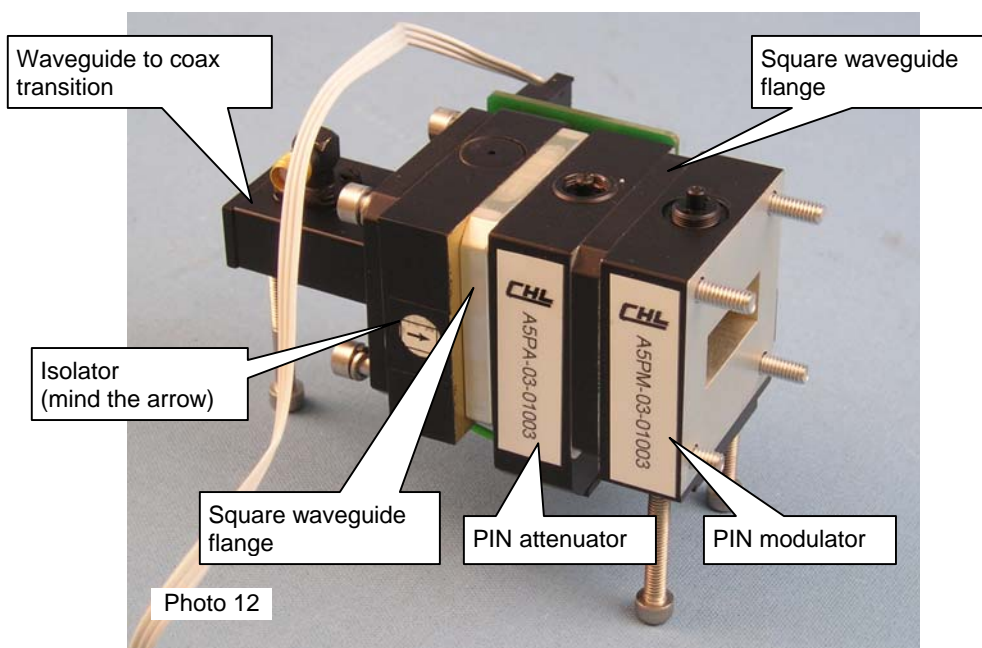
14. Pull the coaxial cable with the SMB connector from the PIN modulator (photo 9).



15. Remove the double directional coupler including the PIN attenuator, the PIN modulator, the isolator and the E-plane bend. A major part of the waveguide run has now been disassembled. See photo 10.

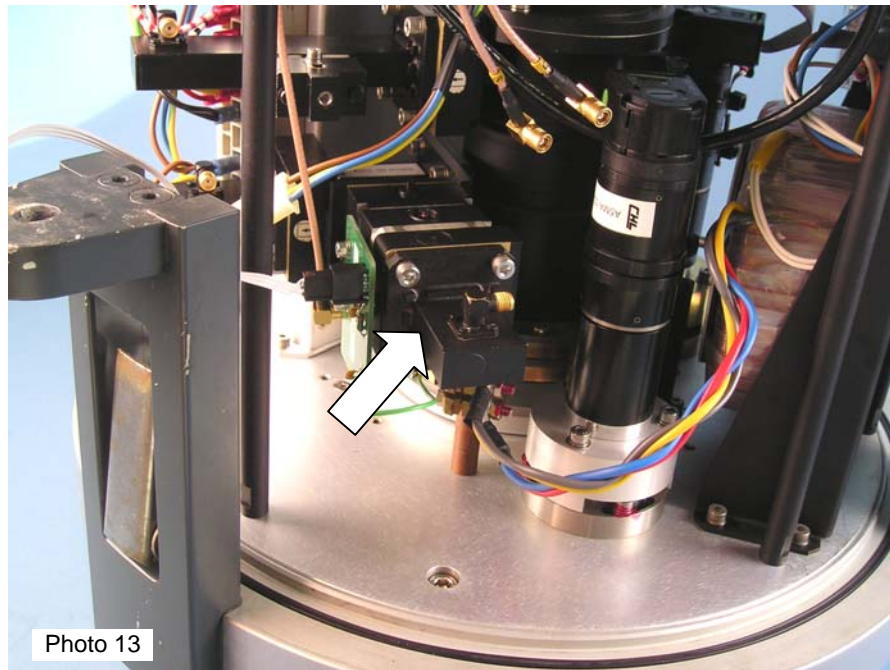


16. Separate the PIN modulator, the square waveguide flange and the PIN attenuator from the waveguide assembly.
17. Remove the four screws connecting the double directional coupler, the isolator and the E-plane bend.

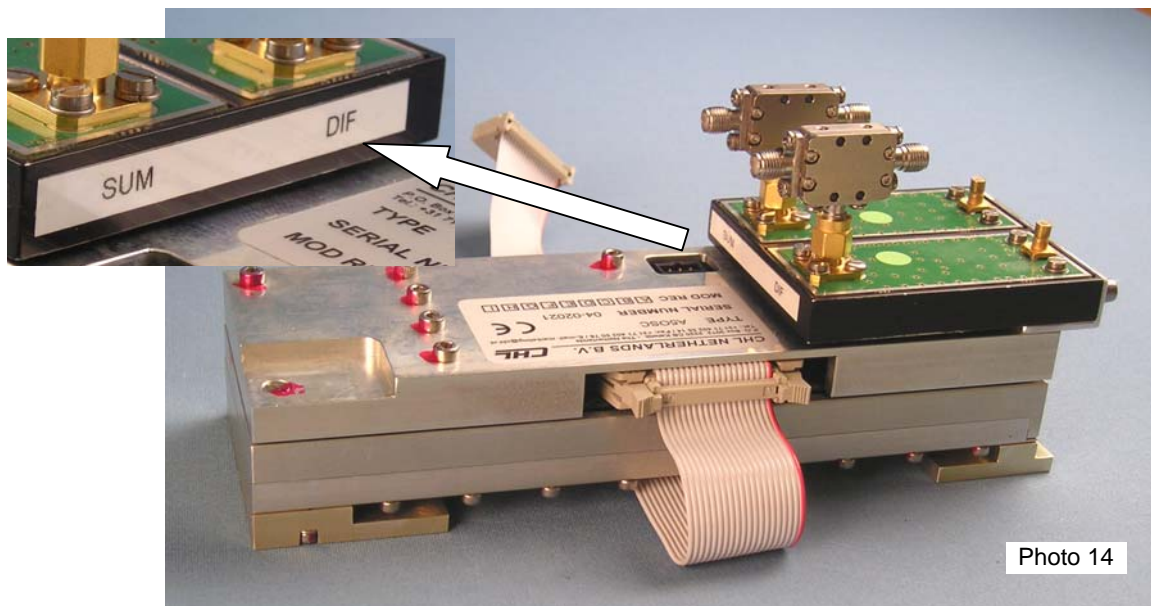


## Artemis MK5 Engineering Note EN5-5

18. Line up the waveguide to coax transition, the isolator (mind the direction of the arrow), a square waveguide flange, the PIN attenuator, a second square waveguide flange, and the PIN modulator as shown on photo 12. Put spring washers on four screws M4x70 mm and join the waveguide parts with the screws.
19. Place the waveguide assembly in the AU as shown on photo 13.

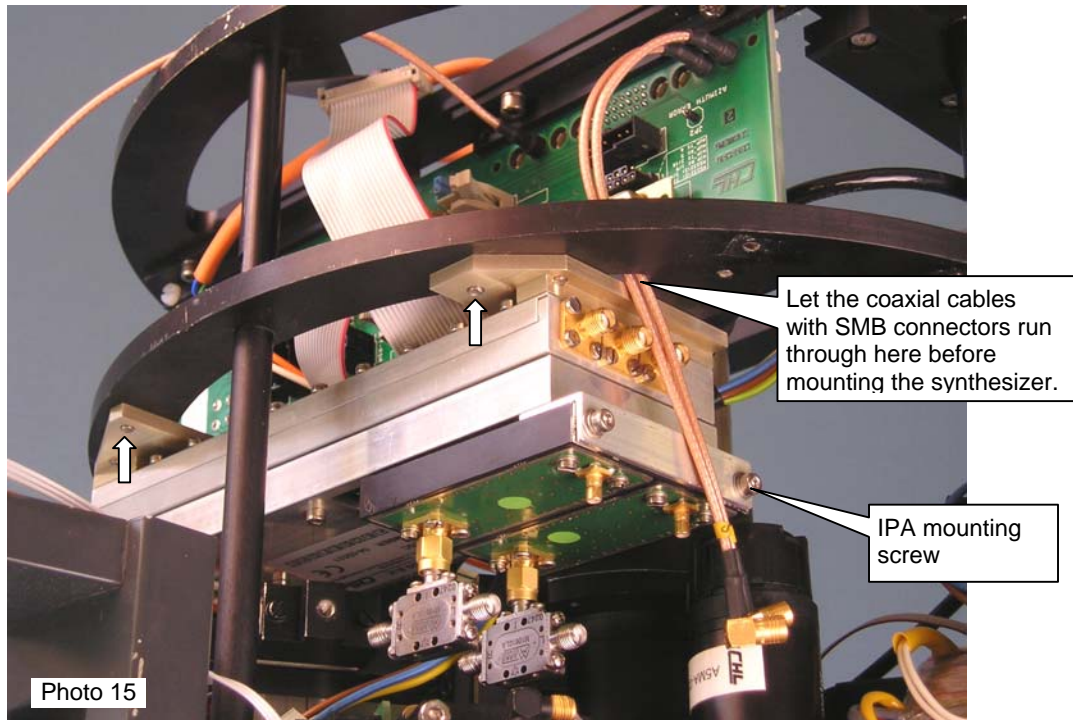


20. Remove the encoder cable connector temporarily from the interconnection board (see photo 8).

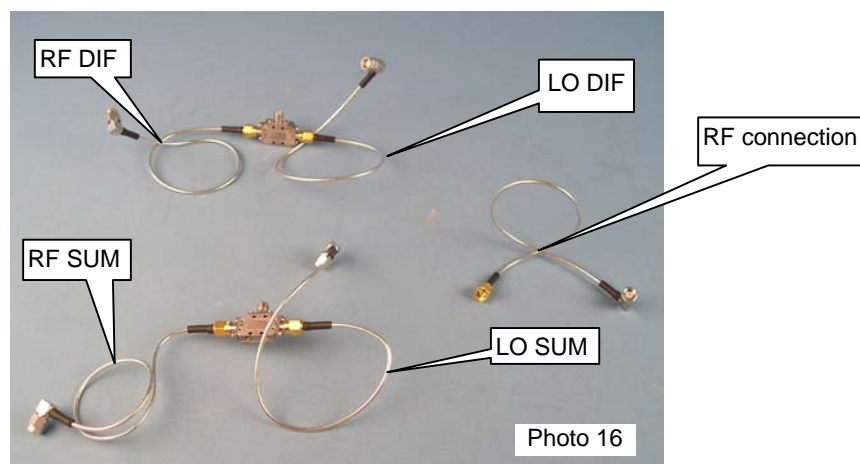


## Artemis MK5 Engineering Note EN5-5

21. Connect the flat cable originally used for the Motor Controlled Gunn to the synthesizer. (The flat cable must be kept close to the bottom of the synthesizer when mounting the synthesizer).
22. Mount the IPA to the synthesizer with two screws M3x6 mm, washers and spring washers.

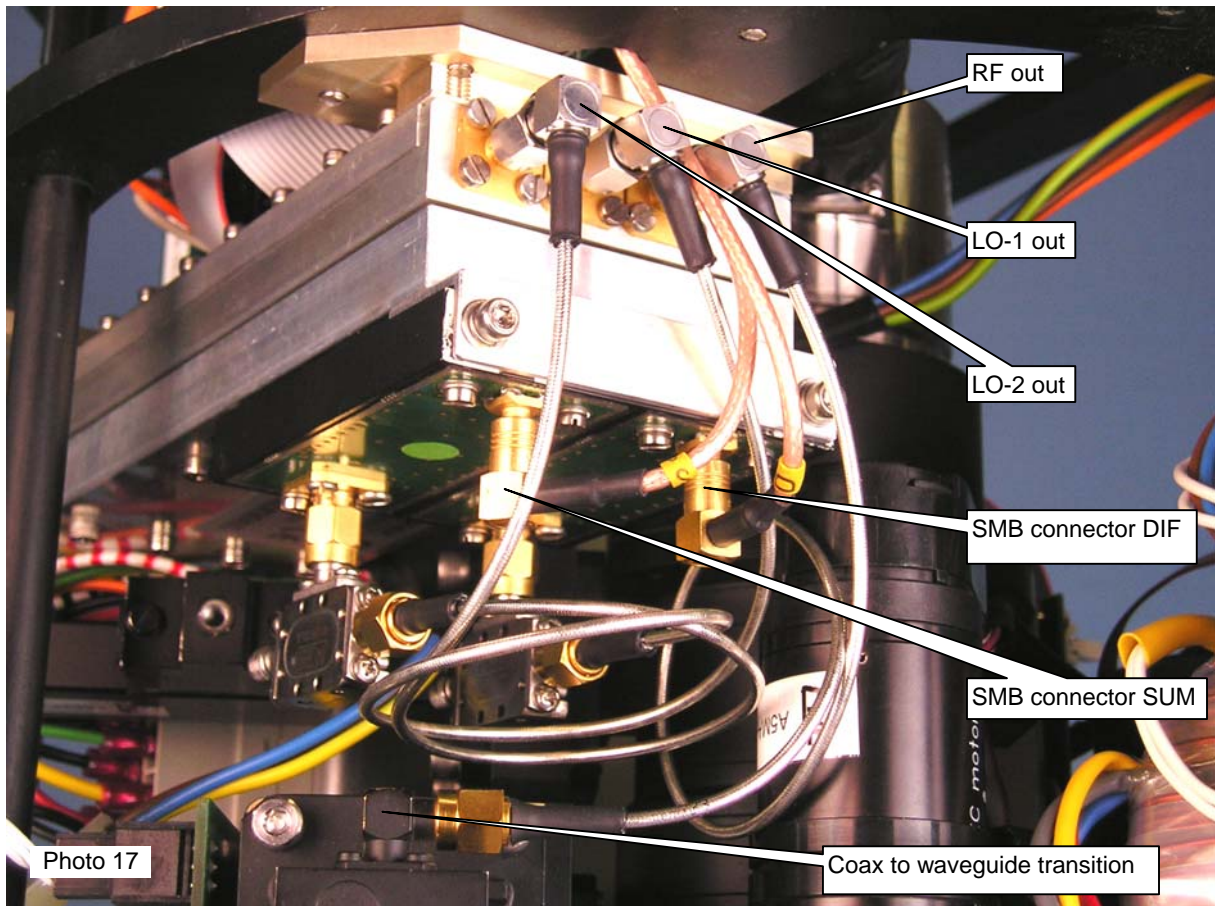


23. Guide the coaxial cables from the interconnection board with the SMB connectors through the frame as shown on photo 15. Then slide the synthesizer over the connector of the power supply and mount the synthesizer at the position where the IPA was situated before, making use of the existing mounting holes. Use four M4x8 mm screws including spring washers. Make sure that no cables are caught.



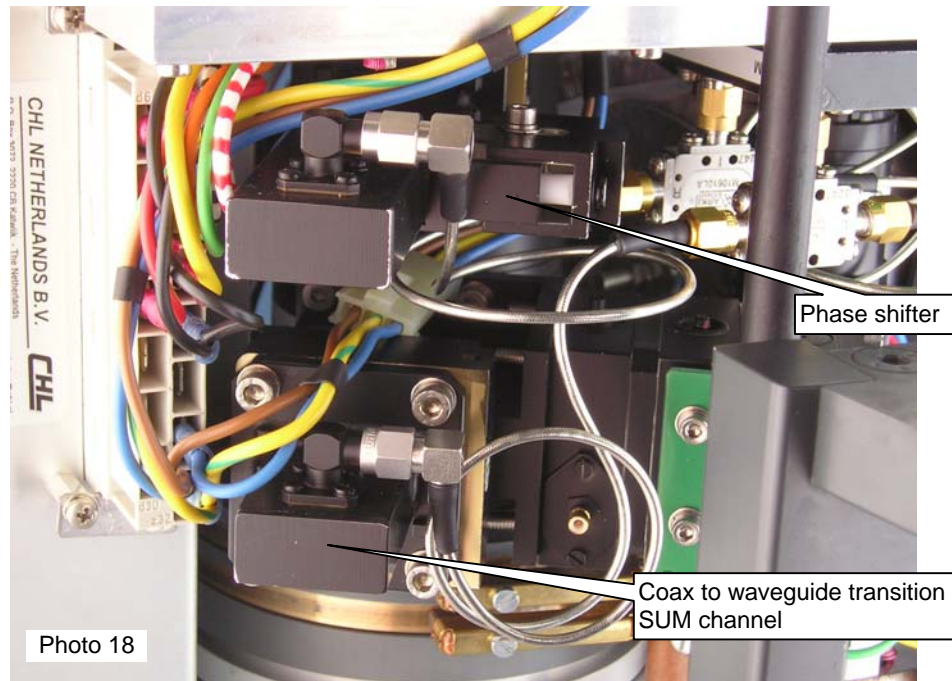
## Artemis MK5 Engineering Note EN5-5

Photo 16 on page 7 gives an idea how the different flexible coaxial cables are to be bent and looped to make the SUM and DIF mixer local oscillator (LO) and radio frequency (RF) connections as described in steps 24, 25, 26 and 28.



24. Take a flexible coaxial cable, loop the cable (minimum bend radius is 20 mm) and connect the RF output of the synthesizer to the waveguide to coax transition. Tighten the SMA connectors with an SMA torque wrench. See photos 16 & 17.
25. Take a flexible coaxial cable and connect the LO-1 output of the synthesizer with the LO input of the DIF channel mixer at the IPA. Tighten the SMA connectors with an SMA torque wrench.
26. Take a flexible coaxial cable and connect the LO-2 output of the synthesizer with the LO input of the SUM channel mixer at the IPA. Tighten the SMA connectors with an SMA torque wrench.
27. Connect the coaxial cables with the SMB connectors to the output of the IPA, taking care of the correct connection of the SUM and the DIF channel (cables are marked S and D).
28. Take a flexible coaxial cable and connect the output of the phase shifter to the RF input of the DIF channel mixer of the IPA. Tighten the SMA connectors with an SMA torque wrench. See photo 18.





29. Take a flexible coaxial cable and connect the waveguide to coax transition to the RF input of SUM channel mixer of the IPA. Tighten the SMA connectors with an SMA torque wrench
30. Connect the flat cable of the synthesizer to the mating cable connector on the interconnection board (back plane). See photo 8.
31. Connect the coaxial cable with the SMB connector to the PIN modulator (see photo 9).
32. Connect the flat cable of the attenuator to the interconnection board.
33. Connect the encoder cable to the interconnection board.
34. Connect the two bottom cover straps, connect the mains cable and the flat cable and put the bottom cover on and lock it by closing the three snap locks.
35. Install the antenna unit, mount the antenna and connect 230 VAC, an operating panel and/or the work station running the Artemis control software.
36. Check correct operation of the station against a counter station.

### **Distribution**

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